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ABSTRACT

This volume focuses on the LIVE (Learning in Virtual Environments) project, a three-year project focusing on developing distance education and open and distance learning skills in teacher education. The pilot stage, reported in this volume, was conducted in the spring of 1997 at the Department of Teacher Education of the University of Helsinki (Finland). The purpose of this volume is to reflect on various questions raised by previous research and the experiences of teacher educators. Papers in this volume include: "The Poor Relation of the Education System? Aspects of Distance Education and Open and Distance Learning" (Seppo Tella); "The Planning of an Open Learning Environment and Didactic Media Choice in Teacher Education" (Janne Sariola); "Variations of Co-Operative Learning: An Analysis of Four Different Approaches" (Anne Vahapassi); "What the LIVE Project Tells Us about the Nature of the School" (Heikki Kynaslahti); "An Overview of Modern Information and Communication Technologies (MICT) in Teacher Education at the Helsinki University Department of Teacher Education" (Aarno Ronka); "Findings from the Pilot Stage of the LIVE Project" (Riikka Ristola & Aarno Ronka); "The LIVE Project: Learning in a Virtual School Program" (Tomi Nummi, Aarno Ronka, & Janne Sariola); and "The Technical Infrastructure of the LIVE Project" (Tomi Nummi). (Contains 114 references.) (AEF)

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ED 428 753

Publications 6

Tomi Nummi, Aarno Rönkä
& Janne Sariola

Virtuality and Digital Nomadism

An Introduction to the L I V E Project (1997—2000)

University of Helsinki
Department of Teacher Education
Media Education Centre

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Media Education Publication 6

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& Janne Sariola

In collaboration with Heikki Kynäslahti,
Riikka Ristola, Seppo Tella & Anne Vähäpassi

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An Introduction to the L I V E Project (1997—2000)

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Preface

Background to the Series

Media Education Publications of the Media Education Centre, Department of Teacher Education, is the continuation of an earlier series called **OLE Publications**, created in late 1995 in order to provide a forum to teachers and researchers to publish articles in English, French or German on themes and topics connected to two European Union-based open and distance learning (ODL) projects coordinated by the Department of Teacher Education, University of Helsinki. The two projects were **the OLE Project** (Open and Distance Learning in Teacher Education to Promote the European Dimension; 1995–1997, and **the APPLAUD Project**[1] (A Programme for People to Learn At University-level at a Distance; 1996–1998).

The Media Education Publications series consists of articles dealing with media education, modern information and communication technologies (MICT), telematics, computer-mediated human communication (CMHC), distance education (DE), open and distance learning (ODL), flexible learning (FL), and comparative education with a special view to the European dimension.

[1] The APPLAUD project is documented on the following Web page: http://www.helsinki.fi/kasv/media/projects/applaud/applaud.html.

Background to the Present Volume

The present volume focuses on **the LIVE Project, Learning in Virtual Environments.**[2] This is the first report of a three-year project (to be concluded in the academic year 1999–2000) based on a collaborative action research approach with a special view, on one hand, to teacher education and, on the other, to ISDN- and GSM-based modern technologies. The pilot stage, also reported on in this volume, was conducted in the spring of 1997 at the Department of Teacher Education of the University of Helsinki.

The purpose of this volume is to lay some initial cornerstones for the project by reflecting on various questions that earlier research and our long-standing experience as teacher educators have drawn our attention to. These perspectives have been permeated by opinions and views of the younger members of the co-authoring team, who, at the same time, have been responsible for the pilot stage of the project.

As a point of departure, let me cite an argument presented by Bell as early as 1967 about the different tenses of man:

> "Time, said St Augustine, is a three-fold present: the present as we experience it, the past as a present memory, and the future as a present expectation. By that criterion, the world of the year 2000 has already arrived, for in the decisions we make now, in the way we design our environment and thus sketch the lines of constraints, the future is committed. Just as the gridiron patterns of city streets in the nineteenth century shaped the linear growth of cities in the twentieth, so the new networks of radial highways, the location of new towns, the recording of graduate-school curricula, the decision to create or not to create a computer utility as a single system, and the like will frame the tectonics of the twenty-first century. The

[2] The LIVE project is documented on the following Web page: http://www.helsinki.fi/kasv/media/projects/live/live.html.

> future is not an overarching leap into the distance; it begins in the present." (Bell 1967, 639; cited in Dutton 1996, 15)

It seems to me that the LIVE Project could, however, take this overarching leap, a quantum leap indeed, as it deals with skills and strategies as well as with the teaching and learning methods and practices the Knowledge-Based Society will expect all citizens to have. To put it very modestly, the LIVE Project is among the very first projects of the 21st century, as it reaches out towards the future that we consider accessible even today.

Gilster (Pool 1997) has recently launched the concept of 'digital literacy', by which he means the ability to understand information and—more importantly—to evaluate and integrate information in multiple formats that the computer can deliver. The LIVE Project clearly aims at the same kind of expertise by giving learners skills and knowledge of the latest digital technologies in the field of telecommunications.

Technology, however, is of secondary importance. The main aims and goals of the project focus on developing distance education as well as open and distance learning skills in teacher education. In this it relies heavily on computer-mediated communication, especially on mobile telecommunicators and multimedia videoconferencing. Yet what counts is the dialogue between human beings involved in the project, between students and students, between teachers and students, between teacher educators and teachers. So it is not only computer-mediated communication that matters but also, and more importantly, human-to-human communication, largely based on dialogic communication enabled by shared understanding and mutual respect for every one in the teacher–learner interaction.

One of the unique characteristics of the LIVE Project is its emphasis on the present, on phenomena that are in the spotlight right now. Kynäslahti (in this volume) writes more about the surprising fact that schools, generally speaking, live in the past, even they do their best to emphasise the present.

Isaacs (1996, 27) points out that one of the salient features of dialogue is its iconoclasticity, its "continuous invitation to people to live from present experience, not from memory". To my way of thinking, LIVE attemps to do exactly this. And as Gilster has aptly put it, the sense of immediacy is something that appeals to young people (Pool 1997, 7).

••

Let me introduce the authors and their articles in this publication.

Seppo Tella discusses the subtle differences between distance education and a number of other concepts, such as open and distance learning, flexible learning, distributed learning, which all have emerged lately due to diverging focuses and emphases. The question is not only of terms; rather, it deals with more profound philosophical approaches towards teaching and learning.

Janne Sariola argues that careful advance planning is indispensable when modern technology, especially multimedia conferencing with videoconference equipment, for instance, is used in teacher education. He further discusses the different ways of choosing the proper media for the right educational purpose, and advises—both pragmatically and logistically—how media planning should be done.

Anne Vähäpassi starts by describing how co-operative learning came to Finland in the late 1980s. She then analyses four main approaches of co-operative learning by highlighting the salient features of these new challenging learning strategies. Her article also includes a good selection of seminal publications in this area.

Heikki Kynäslahti tackles the difficult issue of whether a virtual school and a traditional school can live side by side or whether it is high time to realise that virtual school activities can also take place in a traditional school. He also problematises several social, communal, and societal issues related to the emerging cyborg societies, and feels tempted to suggest that we start talking about a cyborg school!

Aarno Rönkä has a long career as a distance educator. In his introductory article, he summarises some earlier trends of modern information and communication technologies (MICT) in Finnish teacher education. At the same time, he describes a few Finnish milestones in distance education and in computer-mediated communication (CMC).

Tomi Nummi, Aarno Rönkä and Janne Sariola analyse the starting points of the LIVE project and define some of the research areas and research questions to be answered during the first academic year of LIVE in 1997–1998. They build their argumentation on several aspects, i.a., on the national Information Society strategies of the Ministry of Education, on their own teacher education experience, and on the concept of the Virtual School.

Riikka Ristola, having taken part in the pilot stage of the project, discusses her initial experiences gained from the work methods implemented among young pupils of the Finnish comprehensive school. She also describes the differ-

ent levels of telework embedded in the LIVE strategic plan of action.

Aarno Rönkä reports his LIVE experiences of the upper level of the Finnish comprehensive school, as well as the reactions and impressions of his colleagues from the Helsinki Second University Training School.

Tomi Nummi takes a closer look at the technical side of the project's hardware, especially the Nokia 9000 Communicator, but at the same time he reflects upon the solutions that are opened up by the emerging new synergy between education and technology.

As one of the co-authoring team, I believe these articles will give a most promising picture of the LIVE Project and of its focuses and emphases during the first year of the project.

Long live LIVE!

••

My heartfelt gratitude to all the co-authors of this volume. Co-authoring is excellent team work, in which everybody can share his or her opinions, views, disbeliefs, and insights with the rest of the authors.

I am deeply indebted to **Anne Vähäpassi, Tomi Nummi and Kari Perenius** for adding the final touches to the technical side of the publication.

I am most grateful for having the chance to add this publication to the present series of **the Media Education Publications of the Media Education Centre** of the Department of Teacher Education. I hope this publication will contribute to the full utilisation of both media education and latest developments in open and distance learning.

Helsinki, January 19, 1998

MEDIA EDUCATION CENTRE

Seppo Tella

Director of the Media Education Centre
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The Poor Relation of the Education System? Aspects of Distance Education and Open and Distance Learning

Seppo Tella

The purpose of this article is to analyse and to explicate the subtle differences between some of the basic concepts related to what used to be called rather unanimously 'distance education'. What these different concepts have in common is a shared comprehension of a growing number of learning experiences meaningful to human beings taking place outside of the institutionalised educational systems. In distance education, and especially in the different variations now available, there has been a progressive increase in learner control of and widened access to resources, as well as in the emphasis placed on thinking skills and on metacognitive skills related to learning strategies.

More and more teachers and teacher educators are becoming cognisant of the fact that these variations of distance education are constantly gaining ground as they are becoming located more centrally in the mainstream educational systems.

Keywords: Distance education; distance teaching and learning; open learning; open and distance learning; flexible learning; distributed learning; flexi-mode learning; mixed-mode learning.

BACKGROUND

Several researchers have compared distance education to a poor and poorly thought of relative of a much more appreciated mainstream educational system. Lowe (1997), for instance, writes that "[d]istance education has always been the poor relation of the education system. ... At every level it has been given inadequate resources. It has often been staffed by conscripts rather than volunteers and as a consequence it has often not been targeted effectively at the particular needs of the distant learner" (Lowe 1997, 256).

In this article, we argue that it is high time to recognise the values of distance education and, at the same time, to familiarise ourselves with different directions in which distance education has advanced during the past few years. The main argument is that in addition to and in harmony with the developments of distance education, we have witnessed the emergence of a number of other concepts whose significance, role, and future status will be important to the development of educational systems. Some of these recent developments and terms will be briefly discussed in this article. Our examples will employ such concepts as distance teaching, open learning, open and distance learning, flexible learning, distributed learning, and flexi-mode and mixed-mode learning. All of these concepts can be said to represent non-traditional learning approaches.

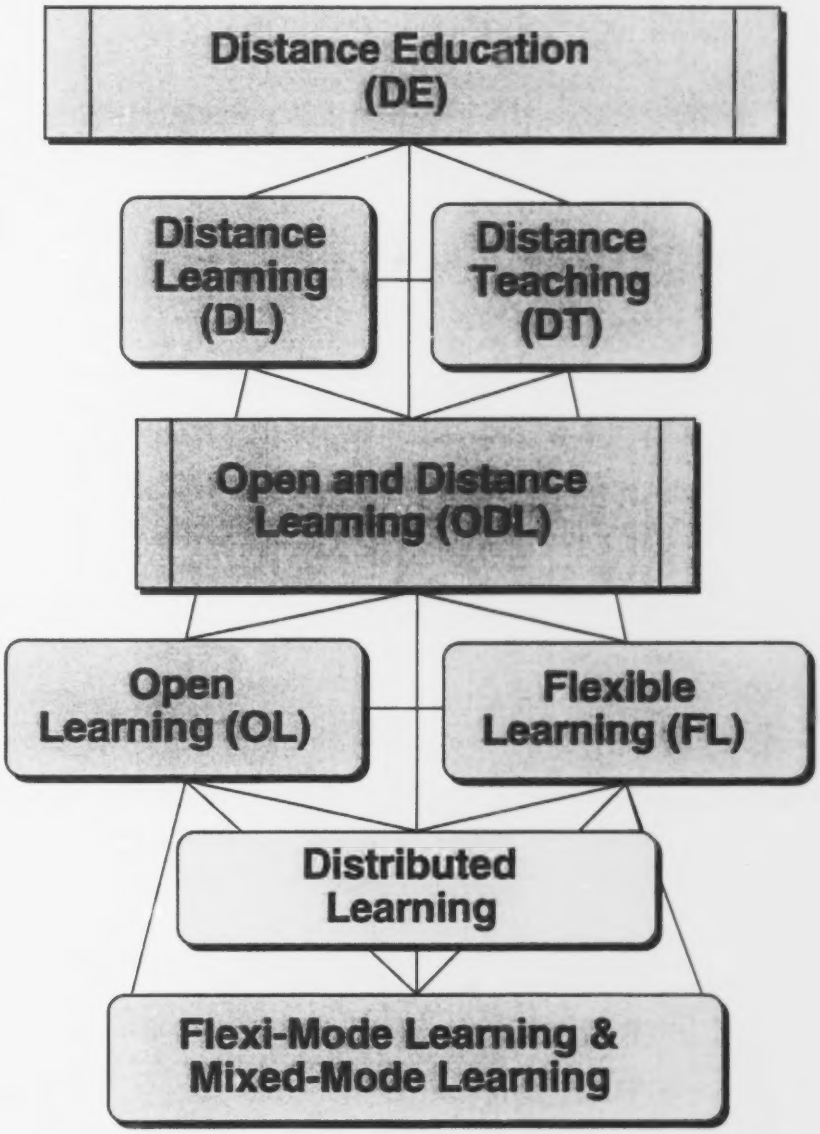

FIGURE 1. SOME CHANGES FROM DISTANCE EDUCATION TO OPEN AND DISTANCE LEARNING (BASED ON TELLA 1997, 15, BUT SLIGHTLY MODIFIED).

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CHANGES IN FOCUS AND EMPHASIS

As explained in Tella (1997, 14–17), distance education (DE) used to be the main concept till the early-to-mid 1990s. Over the years, the concepts 'distance teaching' (DT) and 'distance learning'[1] (DL) have increasingly replaced distance education and even questioned some of its fundamental principles. Some of the key concepts are indicated in Figure 1 (cf. also e.g., Thombs, Sails & Alcott 1989; Chacon 1992; Henri 1992; Rowntree 1992; Farr & Shaeffer 1993; LeBaron & Bragg 1993; Paquette, Bergeron & Bourdeau 1993; Wagner 1993; Husu et al. 1994; Comeaux 1995; Jonassen et al. 1995; McHenry & Bozik 1995; Bates 1995; Bates 1996; Meisalo 1996; Moore & Kearsley 1996; Salminen 1996; Salminen 1997; Tella 1997).

CHARACTERISTICS OF DIFFERENT CONCEPTS

In the following, the main concepts will be described by citing several well-known theorists of the field. One way to analyse these concepts is to first compare distance education with "normal" education and, second, to compare distance education with a number of other concepts that are at present in frequent use and that focus on one or several aspects of the teaching/learning process. After this initial analysis, a summary will be constructed based on some commonalities between the concepts.

[1] Both 'distance education' and 'distance teaching' can be translated into Finnish as *etäopetus*, while 'distance learning' should, perhaps, best be rendered as *etäopiskelu*, instead of *etäoppiminen*.

Distance Education

Distance education has often been contrasted with "normal" education, but, as Lowe (1997, 257) puts it, "[d]escribing something as 'normal' does not mean that it is ideal, or even adequate; it just means it is the practice of the greatest number". And as far as school is concerned, these practices are generally regarded as most durable and hard to change. Tiffin & Rajasingham (1995) use a vivid metaphor to describe the slowness of change:

> "Two by four by six education, where learning is contained between the two covers of a book, the four walls of a classroom, for six hours a day may be in trouble but it has proved remarkably durable." (Tiffin & Rajasingham 1995, 87)

Perhaps there has been some cause for pessimism, but we argue that changes have taken place in school attendance patterns as well as in teaching and learning practices. From the point of view of this article, it can certainly be said that over the last twenty years, distance education has gradually become more and more common in several technologically advanced countries, including Finland, Norway, Canada, the USA and Australia. Therefore one could argue that it has also become less "abnormal", less non-traditional, in its character or even that it already has certain features that may become a mainstream trend in the near future.

What might prove a slight concern to distance educators is that according to some literature (e.g., McHenry & Bozik 1995, 363), "especially in the United States, technological advances and new philosophies of distance education have resulted in a new paradigm of distance education, its goal to offer to the distance student an experience as much like that of traditional face-to-face instruction as possible". It might be much better if the assets of distance education

were not neutralised and done away with but rather encouraged and elaborated upon in order to significantly enrich the educational system.

In Lowe's analysis (1997), distance education has gone through two trends that have not only changed its role *vis-à-vis* mainstream education but also contributed to its gaining ground to a considerable extent. First, there has been a "discernible improvement in the sophistication of the process, with more use made of advanced technology and more programs being expressly designed for the learner" (Lowe 1997, 257). Second, Lowe (1997, 257) continues, "the term 'distance' has become increasingly inappropriate; each year, more of the learners using this mode of education are not geographically remote from our urban areas."

Distance education has often been divided into *three generations* (e.g., Bates 1995; Moore & Kearsley 1996). *The first generation* is characterised by a single technology, which often did not enable direct student interaction with the teacher. The best-known example is correspondence education.

The second generation of distance education consists of a consciously integrated multiple-media approach. This generation also contains specifically designed materials for study at a distance with a two-way communication facility between the learner and a tutor. Bates (1995, 23) cites autonomous distance teaching universities as examples of second generation distance education. Moore & Kearsley (1996, 20) cite open universities, broadcast and teleconferencing.

At the third stage, distance education takes advantage of two-way or even multidimensional communications media, enabling direct and often synchronous interaction between the teacher and the learner. Bates (1995, 23), for instance, emphasises the fact that third generation distance education guarantees a much more equal distribution of communication between students (or groups of students) and teachers. Moore & Kearsley (1996, 20) refer to networks and multimedia.

Lowe's slightly ironical analysis (1997) of the progress of distance education is worth citing, as it questions the unfounded optimism of sheer technology being used if it does not relate properly to pedagogically relevant learning contexts:

> "When such institutions as the UK Open University succeeded in harnessing more modern technology to the needs of distant learners, it raised the entire profile of distance education. The media saw the Open University as an institution of the late twentieth century because it used television and radio as part of its learning packages. I argued that its advance was more modest, though still significant. The Open University was *the first sixteenth century university* [italics added], as it was the first one to recognise the invention of the printing press; most student learning occurred by interaction with the printed course materials. This was no small advance in time, as *most other universities are still back a couple of thousand years in the mode of assuming that wisdom is transmitted orally* [italics added]. Many universities simply arrange for students to be ushered at regular intervals into the presence of an academic who can deliver a long [and preferably audible] monologue in the general direction of the multitude. A visitor from another galaxy who happened on a typical lecture in the sciences or most fields of technology would conclude that the purpose was to give the students a *verbatim* transcript of an inaccessible manuscript! The Open University played an important role in directing attention toward the needs of the learner, thereby raising questions about the

> educational effectiveness of most traditional programmes of higher education." (Lowe 1997, 257)

This kind of criticism towards traditionally delivered academic lectures and seminars gives a good springboard to distance education delivery systems. Maxwell (1995, 43), for instance, defines distance education as "a mode of delivering a course of study in which the majority of communication between teachers and students occurs noncontiguously, and the two-way communication between teacher and student necessary for the educational process is technologically mediated."

On the whole, Maxwell (1995) regards distance education as a non-traditional learning approach that might provide an option for reaching non-traditional students. He further argues that distance education refers to a mode of delivery with certain characteristics that distinguish it from the campus-based mode of learning. (Maxwell 1995, 46)

Even if distance education is often thought of as a delivery system by means of (tele)communications, some definitions emphasise the flexibility of study enabled through its use. Bates (1995, 27), for instance, contends that distance education is one way "by which learners can study in a flexible manner, by studying at a distance from the originator of the teaching material; students can study at their own time, at the place of their choice (home, work or learning centre), and without face-to-face contact with the teacher." Moore & Kearsley (1996) share this view when they define distance education as

> "planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as

> well as special organizational and administrative arrangements". (Moore & Kearsley 1996, 2)

Moore & Kearsley (1996, 3) further underline the learners' point of view when they write that "[d]istance education aims to provide instruction in places and times that are convenient for learners rather than teachers or teaching institutions".

As mentioned above, in addition to distance education, several other terms have started to gain ground. In the following, some of these will be briefly characterised.

Distance Teaching and Distance Learning

The main difference between distance education and distance teaching is in the focus of interest as well as in the scope of reference. Distance education can be seen *a priori* from the perspective of educational systems. It is often thought of as an educational delivery system made possible by different forms of technology. Distance teaching, on the other hand, implies a more direct approach to the teaching process, either at a distance (usually the student's interpretation) or through distance (the teacher's interpretation).

Distance learning, again, underscores the learner's point of view, whether seen by himself or herself or by an institute that organises and delivers the materials. However, implicitly, distance learning puts an emphasis on the learner's side, making him or her more responsible for the latter part of the teaching/learning process. In Kay's (1997, 229) view, in distance learning, the learner "receives learning materials in printed form or via another media, such as the Internet and returns assignment work for correction by a teacher."

Distance education may, implicitly at least, accommodate both distance teaching and distance learning, as everything in a broader sense is education. Teaching can be defined to include various kinds of studying and learning processes. Recently, a strong shift of emphasis has taken place from teaching-based approaches towards learner-centred or learner-sponsored approaches, which partly explains why 'learning' is so often employed instead of 'teaching'[2]. All in all, the importance of education might still be recognised as an overall term.

Open Learning

Another popular term is open learning (OL). When contrasted with distance education (DE) or distance teaching, it seems obvious that the differences between OL and DE are much bigger than differences between DE and distance teaching or distance learning. When defining OL, many reseachers (e.g., Bates 1995; Maxwell 1995; Kay 1997) stress three things: openness, student-centredness, and the fact that open learning is rather a philosophy or an attitude towards organising the teaching/learning process in a flexible manner. Other issues often encompassed with open learning include access, equity, independent learning, learning styles, instructional design and student learner support (e.g., Kay 1997, 229). In his open learning model, Kember (1995) argues that open learning is a more general concep-

[2] Distance learning = *etäopiskelu* in Finnish. It may be worth pointing out that the term 'learning' in English also refers to studying, while in Finnish it mostly refers to the product of studying. Cf. 'learn = gain knowledge of or skill in, *by study* [emphasis added], practice or being taught' (Advanced Learner's Dictionary of Current English).

tualisation than distance education but that it can therefore also include distance learning as one form.

Maxwell (1995) defines open learning as "a student-centered approach to education that removes all barriers to access while providing a high degree of learner autonomy." He further argues that

> "... [d]istance education and open learning should be recognized as two distinct concepts. Distance education refers to a mode of delivery with certain characteristics that distinguish it from the campus-based mode of learning. Open learning refers to a philosophy of education providing students with as much choice and control as possible over content and learning strategies. A distance-education institution could be open or closed. An open learning course could be offered on campus or at a distance." (Maxwell 1995, 46)

Bates (1995) sees open learning primarily as a goal, or as an educational policy, "the provision of learning in a flexible manner, built around the geographical, social and time constraints of individual learners, rather than those of an educational institution" (Bates 1995, 27). He further argues that "[o]pen learning may include distance education, or it may depend on other flexible forms of learning, including a mix of independent study and face-to-face-teaching. It may also include other concepts, such as open access without prior requisite qualifications. Both open-ness [hyphenated in the original] and distance education are never found in their purest forms. No teaching system is completely open, and few students ever study in complete isolation. Thus there are degrees of open-ness and 'distance'—indeed, distance is more likely to be psychological or social, rather than geographical, in most cases". (Bates 1995, 27)

Open learning can also be circumscribed by referring to Wylie (1996), whose questions and answers have been slightly elaborated for the purpose of this publication.

> 1) Whom does open learning serve?
> It serves learners who look for flexible entry provision of learning materials.
> 2) Why is open learning needed?
> Because it is responsive to learner needs.
> 3) What does open learning enable?
> It enables the learner to negotiate content on a more individualised basis.
> 4) How does open learning serve the learners?
> It is basically resource-based and offers alternative strategies.
> 5) Where is open learning possible?
> In quite a few places, such as in homes, in workplaces, and in study centres.
> 6) When is open learning perhaps more effective than distance education?
> Timewise, open learning enables a flexible start, it gives the learners a choice of individual pace, and gives them an opportunity to decide the completion times.
> 7) How effective is open learning?
> At least it enables the learner to participate in assessment in various ways.
> 8) Who helps a learner who uses open learning?
> A large variety of advice and support should be available to the learner, especially through telecommunications.
> (Wylie, 1996, 288)

The last point is directly related to the teacher–learner interaction, which is obviously a crucial issue. It is, however, questionable, as Gell & Cochrane (1996, 252) argue, whether "[on]line self-learning packages fundamentally question the traditional role of the educator by giving students greater individual control. Effective learning can be realized by providing a student with a computer, loading the educational software, and walking away." Another approach is to see the teacher's role change in a new direction. This has led

Tiffin & Rajasingham (1995, 154) to introduce, though half-jokingly perhaps, the idea of a "just-in-time teacher" whom the learner could consult when he or she needs one. They develop their idea as follows:

> "One of the great strengths of the classroom system is that a learner has only to put their hand up to get a teacher's attention. ... What is [now] needed is a network of teachers that makes it possible for learners to find the teachers they need when they need them. ... There need be no restrictions on the distance to be travelled to meet a teacher. A learner can have a teacher in telepresence from anywhere in the world. Just as learners can be anywhere, so too can teleteachers." (Tiffin & Rajasingham 1995, 154)

Open and Distance Learning

Open learning (OL), together with flexible learning (FL) and distance learning (DL) seem to have formed the concept of open and distance learning (ODL). The role of the European Union, and especially the influence of its ODL programme, has been rather central in the genesis of this term. According to the Socrates & Youth Technical Assistance Office (1995), open and distance learning (ODL) involves the use of new methods—technical and/or non-technical—to improve the flexibility and feasibility of learning in terms of space, time, choice of content, or teaching resources and/or to improve access to educational systems from a distance.

The tools and software used in ODL are often quite the same as in distance education, but there is a shift in emphasis from a more teacher-centred environment towards an open learner-centred and virtual learning environment with a focus on distributed expertise and cognitive tools and groupware.

Bates (1995, 27) contends that "[a]lthough open learning and distance education can mean different things, the one thing they both have in common is an attempt to provide alternative means of high quality education and training for those who either cannot go to conventional, campus-based institutions, or do not want so." He also argues that by removing the barriers of access to higher education, open and distance learning give a second chance to people who, for academic, personal or social reasons, are unable to enter or complete higher education on leaving the school system (Bates 1995, 27).

For the time being, we regard ODL as the main concept, or as a provisional stage to which distance education has advanced. First, it combines the key concept of openness with the traditional idea of overcoming 'distances'. Second, it appears wide enough to embrace most of the present interests and emphases in the field, and third, it is relatively widely used in Europe at the moment. However, it might be so that ODL will change into something else in a few years' time, depending on future developments. Yet it seems probable that the concept of openness will remain as one of the central constructs in educational parlance, and even more if the emerging concept of constructivism continues to gain ground.

Flexible Learning

In most literature, flexible learning is not often used independently; rather, it is frequently associated with open learning. Szewcow (1997) is aptly ironical when citing a non-educational colleague who seems to be at a loss when facing all the different terms and concepts of distance education:

> "Flexible learning? For a non-educationalist coming to terms with this concept and its implications is daunting. At one extreme, which I prefer most, is the (private) comment from a nameless expert in education: 'If you define it, it is no longer flexible'." (Szewcow 1997, 441)

Flexible learning is also related to the term 'flexible delivery', i.e., to an approach to vocational education and training that focuses on how clients (often from industry) want to learn. In this interpretation, flexible learning or delivery emphasises the demand side of training, rather than the supply side. Kay (1997) argues that "[o]pen learning is sometimes differentiated from flexible delivery by describing it as a philosophy and flexible delivery as a strategy to implement the philosophy." (Kay 1997, 229)

Most researchers contrast flexibility with openness. Atkinson (1996), for instance, argues that 'open learning' carries connotations of learning not being closed or blocked off, and so able to be more readily accessed with the opportunity to participate and succeed, while 'flexible learning' carries connotations of learning being more adaptable and versatile, thus enhancing opportunities to participate and to be successful. In her opinion, openness can be seen as relating more to an outcome and flexibility to the means of achieving this outcome. The two terms appear to be two sides of the same coin. Flexibility contains dimensions of access (the opportunity to participate), timing and duration, location of study, curriculum factors, and learning support. (Atkinson 1996, 45–46)

Nunan (1996) underlines the importance of user-centredness: "Philosophically, flexible learning represents a user-centred approach to learning. Practically, flexible learning has the capacity to cater for a wider variety of learning styles and patterns that conventional learning styles" (Nunan 1996, 1).

Distributed Learning

One more term used in the literature is 'distributed learning'. Bates (1996) characterises it as

> "... a learner-centred approach to education, which integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The model is based on blending a choice of appropriate technologies with aspects of campus-based delivery, open learning systems and distance education. The approach gives instructors the flexibility to customize learning environments to meet the needs of diverse student populations, while providing both high quality and cost-effective learning." (Bates 1996, 9)

In Bates' view, the terms 'distributed learning' and 'distance education' do not mean the same, though many people use them interchangeably. As an example, Bates describes university-level courses for fully registered, on-campus students to whom a substantial part of the material to be learnt is available on the Web or on CD-ROM. This material is accessible to the students at any time, from the campus or from home. However, Bates remarks that these students have to be 'resident', i.e., available for lectures. In this case, this is distributed learning but not distance learning nor open learning since students have to meet all the stringent entrance requirements to be registered as university students. (Bates 1996, 9–10)

Flexi-Mode and Mixed-Mode Learning

This section is intended to highlight two other terms being used quite frequently. These terms correspond to the Finnish *monimuoto-opetus*, launched in Finland in the late-1980s and early 1990s, combining face-to-face teaching and distance education periods. In Finnish educational parlance, *monimuoto-opetus* was often translated into English as 'multi-form' or 'multi-mode' teaching. One of the earliest translations, 'multimedia education', is not referred to here, as it now implies a different concept.

Both flexi-mode learning and mixed-mode learning are being used to refer to various forms of distance and face-to-face learning. Kay (1997, 229), for instance, defines flexi-mode as "a combination of distance and face-to-face learning [which] can utilise both print or electronic learning materials."

Bates (1995) also speaks of mixed-mode learning and bases his definition on some British Columbia Ministry of Skills, Training and Labour documents. He also makes an important remark on the ratio between full-time and part-time students:

> "While schools, colleges and universities will still have reason to provide campus-based learning to groups of learners over set terms or semesters, for social and for some instructional reasons, a great deal of learning will take place outside of this context. Full-time students are *already* a minority in Canadian universities and colleges." (Bates 1995, 242)

Bates's last comment on the situation in Canadian universities is of interest, as it clearly highlights one of the tendencies we are about to witness, i.e., the poor relatives of the mainstream educational system, whether we call them dis-

tance education, open and distance learning or flexi-mode learning, will gradually come to the centre stage, and more and more high-profile teachers as well as students will come to realise their intrinsic value and start using their potential, physically and virtually.

THE LIVE PROJECT REVISITED

This article belongs to a series of other articles, all of which are connected to the LIVE Project of the Media Education Centre of the Department of Teacher Education at the University of Helsinki. The project is described in greater detail elsewhere in this publication; however, this is the place to think of how to describe the project in terms of what has been said above.

The project has been created and established on two slightly differing cornerstones. First, it makes full use of an ISDN-based videoconference network between four schools and the Media Education Centre. This basis is partly grounded on an earlier project carried out at the Department of Teacher Education, together with the Second Normal School (the Kilpisjärvi project, 1994–1997; cf. e.g., Husu et al. 1994; Meisalo 1996; Salminen 1997).

Second, it takes advantage of two concepts that are interlinked at present. One is the concept of the virtual school, which was launched in the late 1980s and which became a topical issue by the early-to-mid 1990s (e.g., Tella 1995a; Tiffin & Rajasingham 1995). The second concept is mobility, which is associated with nomadism (Attali 1990), removal of the constraints of distance, time, and location (Giddens 1990; Negroponte 1995; Gell & Cochrane 1996). Mobility in the LIVE project is grounded on the context of mobile telecommunications.

It is mainly thanks to this latter concept, mobility, that the project gains a lot of openness, flexibility, and immediacy. Distance is still there, but not as a restricting element; rather, it gives more scope to the topography of the project. It is also a hidden asset, making it possible to link other partners to the project if need be.

In the LIVE project, the teacher–learner interaction is still essential. The teachers and the researchers work together, and together with the learners, who enjoy a great amount of freedom to have their say about the contents, the procedures and the general ways in which the project is being conducted. Collaboration via modern telecommunications is central.

If the concepts presented earlier in this article were to be adapted to the LIVE project, we would be inclined to say that it is mostly an open and distance learning (ODL) project with some elements borrowed from the distance education (DE) tradition. These elements are easier to understand when we are reminded of the fact that the project is carried out at the primary and lower secondary levels of the Finnish comprehensive school, meaning that the majority of the learners involved are between seven and fifteen years of age.

Nummi, Rönkä & Sariola (1998) speak in their own article of open and flexible learning environments, which is not a term used in this article, but which describes the nature of the LIVE project to the point. The project is still at its initial stage, so it remains to be seen in which direction it will move and develop.

SUMMARY

Rudyard Kipling once wrote, "I keep six honest servingmen. They taught me all I knew. Their names are What and Why and When. And How and Where and Who." Wylie (1996) already took the opportunity to profit from these servants but we feel the same questions will have to be asked again and again in order to understand the bewildering terminology in this field.

Fundamentally, the chaos concerns the terms being used, not the concepts or the constructs themselves. The latter can clearly be circumscribed by a progressive increase in learner control and in widened access to resources, in emphasis on thinking skills as well as on metacognitive skills related to learning strategies. 'Distance' is disappearing, both physically and psychologically. The latest human/machine interfaces make the use of new technology more user-friendly. Bates (1995, 242) even questions the role of distance education in his polemic title "Hello, technology; goodbye, distance education?". Perraton (1993, 3) argues that the term 'distance education' is a misnomer, as the most effective programmes include an element of face-to-face teaching as well as using correspondence and mass media, or, if we update Perraton's argument, using telecommunications and small group or target group telematic communication.

Conceptually, the terminology presented in this article can be analysed from the point of view of the learner, the teacher, or the institute. Any of the terms can be regarded from these three perspectives, leading to slightly diverging interpretations. Take distance education or distance teaching as an example. Institutionally, students are somewhere else, not in the institute, or at least not all the time. Teachers

may or may not be institutionally-based, most often they probably are. Yet it could be argued that in distance education also teachers can be physically independent from the institute they represent. This can be done quite easily through telecommunications, for instance.

From the teacher's point of view, education or teaching is being distributed or delivered to a distant point where the students are. From the student's point of view, the teacher is at a distance, while there's no point in arguing that his or her own studying process is further off than in any other learning situation. And if the student is called a learner, then the learning process naturally takes place very close to the learner himself or herself, i.e., in his or her own head. At any time, the learner is face-to-face to his or her own learning strategies and processes. All this makes the task of learning very intensive and each learner must also assume a great deal of responsibility for the learning process. From the student's point of view, access to the information sources, access to help and support as well as access to the telecommunications resources become indispensable.

All in all, it seems that the different approaches to distance education can be seen from a number of perspectives. Some approaches have been called methods (like distance education), others philosophies or even ideologies (like open learning). Some of them rely more heavily on an intensified use of modern information and communication technologies. Some are named after the institute's point of view, while others underscore the learner's idea of distance. What these different terms and definitions have in common is a shared comprehension of the fact that an increasingly growing number of learning experiences meaningful to human beings are taking place outside of the institutionalised educational systems. In addition, life-long learning (or lifetime learning) has become a necessity, leading, perhaps,

to meltdown in education, as Gell & Cochrane (1996, 252) have put it, encompassing all ages and bringing remote capabilities into the home.

This realisation has already resulted in many countries in the genesis of so-called dual-mode institutes, i.e., institutions that organise both face-to-face and distance education, whose levels of formality equally represent various layers of reality as sensed by those taking part in these educational implementations. Perhaps all this can be epitomised in Thomas' (1991, 16–17) remark that learning is something man has to do himself, while education is done by somebody else. This golden rule still holds whether we speak of distance education, open learning or flexible learning.

The Planning of an Open Learning Environment and Didactic Media Choice in Teacher Education

Janne Sariola

This article takes a look at factors which have an effect on the planning of open learning environments and media choice from the point of view of the teacher and teacher education. Planning and media choice are seen as part of a broader change in education which includes shifts in concepts of learning towards constructivism, the expanding pedagogic applications of information and media technology, and the transformation of digital media into part of everyday life. Research and development at the Media Education Centre at the University of Helsinki has aimed at finding planning models for open learning environments through which the teacher and the student can become more aware of their own methods of planning their teaching, but at the same time expanding their activities from traditional classroom-oriented planning towards planning focused on the learning environment. From the point of view of the pupil, the goal-directed development of skills required by the information society and the evaluation of the pupil's own study and learning strategies are highlighted in the planning of the learning environment.

Keywords: Open learning environment; planning; mobility; digital portfolio; didactic media choice; teacher education; media education.

FROM THE CLASSROOM TO AN OPEN LEARNING ENVIRONMENT

Teachers have traditionally started to plan their teaching by defining its aims, planning its contents and choosing work and evaluation methods. Through the organisation of the physical classroom and the choice of working methods, the target has been on teaching where the teacher controls the speed and contents of the learning process. These kinds of teaching arrangements are mainly based on a behaviourist concept of learning, in which the pupil is seen as a passive recipient of information and the teacher as a provider of ready-analysed information (e.g. Saarinen, Ruoppila & Korkiakangas 1994, 66).

The shift towards a learner-centred concept of learning has begun to break down the teacher-centred idea of the organisation of teaching. At the same time, attempts have been made to activate students in their learning and study activities to ensure the high quality of learning. The Department of Teacher Education at the University of Helsinki has during recent years carried out applications based on co-operational learning in, for instance, teaching practice and media education studies. Forms of study have thus included pair practice and team work, for example. For the teacher this kind of socio-constructivist approach increases communality and the integration of the whole learning environment in the planning of teaching. For the learner the construction of knowledge becomes part of social interaction and the surrounding reality. This can also be seen as tending to bring the school and society closer to each other, as the school attempts to create social networks between itself and the surrounding reality.

The objective of planning centred on the learning environment is a situation in which the teacher creates for the individual pupil the possibility for interaction with other learners and the environment. The concept of the learning environment includes learning itself, but it emphasises the role of the teacher as supervisor of the learning process and organiser of the teaching arrangements. The teacher's task is to outline the use of metaskills and planning and evaluation strategies; the learner's task is the versatile development of his or her own study strategies. Pupils also need to develop their skills of obtaining, managing and producing information.

The concept of open learning includes the perspective of open study. The open learning environment is seen as an environment for the teacher's and pupil's activities within which learning is seen as an active process in a multi-information, co-operational network environment. The concept of openness is, through modern information and communication technologies, associated with telematic networks, as well as with flexibility in study situations, learner mobility and possible independence from time and place. Open study is often associated with open and distance learning, but especially with flexible study and learning. From the point of view of the student, openness can be interpreted as choices in learning/study situations, for example. (cf. Tella in this publication; Tella 1997, 14–15; Rich 1994, 11; Nummi, Rönkä & Sariola 1997, 163)

The different forms of media influence the student's choices in the use of network-based learning (e.g. Tella 1997, 13). In this article the concept of medium and media is interpreted especially as digital media and the new digital media, which according to Hintikka (1996, 3) are characteristically network-based, multidirectional, personal and filtering. They can also be said to be characterised by transactional-

ity, which connects them more clearly with actual teaching, as teaching is always a transaction (Tella & Mononen-Aaltonen 1998, in press).

Digital media enables the copying, widespread distribution and editing of information. From the point of view of teaching, digital media provides an easier way for the production and distribution of teaching materials; on the other hand, digital teaching/production of teaching materials requires a thorough knowledge of and skills for analysing multimedia. The concept of network as associated with the new media can here be connected to the telematic teaching and learning environment based on information and communication technology. During their education students communicate with each other through several media, using electronic mail and video or computer conferences. The new media also enable the creation of virtual spaces and environments within the net, and the use of these in teaching and study. They can thus be seen as an environment which can offer more effective ways of dealing with practical matters also in reality (Hintikka 1996, 17). In an open learning environment, the teacher aims to guide the student towards a goal-oriented, didactic media choice. The planning of an open learning environment and didactic media choice are part of the field of media education, whose research topics include the applications of virtual pedagogics and didactics from the point of view of education (Tella 1997, 11).

Seen from a didactic point of view, the planning of a study environment has to continue to be goal-based, but in a way which enables students to define the direction of their own studies and to constantly evaluate their learning processes. The traditional framework, aims–action–evaluation, is usable for planning if these didactic elements are used flexibly for teaching, and the teacher and pupil can together con-

struct their own, goal-targeted themes for study. During the coming years planning is likely to shift increasingly from teacher-centred planning to learner-centred, flexible thinking focused on the learning environment. Nevertheless, it can be seen as important for the teacher and pupil to be aware of their own typical ways of planning and their style and concept of learning at any given moment. It is easier to develop and expand one's planning practices if one is aware of them in the first place.

FROM THE INFORMATION SOCIETY TO THE SKILLS SOCIETY

During recent years, the transition towards the information society has been a topic of wide public discussion in Finland. The most critical see the information society as a world of computers and robots which creates inequality, whereas others see it as a possibility and route to a new communication and learning culture. According to the Ministry of Education Information Strategy for Education and Research (http://www.minedu.fi/infostrategy.html), teachers are key players in the shift towards an information society. Thus the development of education, especially teacher education, is targeted at the management of skills required in the future. At the same time, the rapid development of information and communication technology on the market has forced teacher education to tackle the pedagogic challenge of discovering the best way in which the new technology can support study and learning. At school level it has been seen as a problem that schools do not have their own information strategies or vision of where they should be heading in the information society. In this case the role of teacher education is to train teachers in the plan-

ning of new working models and strategies. Finnish teacher education views the teacher as a professional who researches his or her own work. This has been visible in media education studies as a will to educate teachers as self-researching pedagogic experts in information and communication technology. The creation and development of information management strategies for schools can be considered one field of expertise for these new professionals.

The Development of Information Strategies for the School

Supervision which aims at developing the teacher into a planner of open learning environments is a demanding process. In what follows, I shall describe the training model used within the continuing education modules at the Media Education Centre; the goal of this model is to create and develop the school's own information strategy. The aim is to integrate the information strategy as a natural part of the school curriculum. The training module begins with a discussion of values in teams, during which teachers become aware of their own attitudes towards information and communication technologies and the information society. At the same time this discussion of values opens new perspectives on the teachers' own concepts of learning and information, didactics, and their attitude towards the pupils. The way in which teachers act, teach and supervise are intertwined with their values; values influence the teacher's choice in the supervision of a learning process. In these groups, teachers discuss the skills our pupils need in an information society. Here we can ask the generalised question about what skills are needed in life. The continuing education groups at the Media Education Centre have given the answers that the information society requires skills of inter-

action, of taking control over one's own life and obtaining knowledge, along with the ability to react flexibly to new situations.

According to Ritva-Sini Härkönen, who has discussed information society skills from the point of view of communication, the pupil should have the skill of media literacy, i e. the ability to read media texts, and the ability of media writing which means the skill of producing verbal, visual and auditive texts, and especially combinations of the three (Härkönen 1994, 210–211). In the current situation we could already be talking about multimedia literacy, which takes better account of the requirements of hypertextuality in information and communication-based teaching, study and learning than the older forms of media literacy. After the skills-related value discussion the following question often emerges: if the aforementioned skills are important to teachers from the point of view of survival in the information society, how are these skills visible in the teacher's own teaching? Teachers write out for themselves their thoughts on valuable skills. These skills are then processed into goals, which are pursued by working in an open learning environment.

From the point of view of learning theories, the general goals of planning open learning environments aim to create study situations in which the learner has the possibility of active learning and interaction. Studying is seen as an active process, and learning as its result. Another goal is to develop information society skills. The Information Strategy for Education and Research (1995, 39) states that the school should provide every girl and boy with the skills of obtaining and managing information and communicating as required in the information society. The aforementioned skills are also known as metaskills, i.e. skills of handling in-

formation, planning and evaluating one's own work, and the ability to communicate within information networks.

The values, the aims and objectives of teaching, are incorporated on a national level within the Framework Curriculum (Anon. 1994). The next level is the municipality-based curriculum and then the schools form their own curriculums. The aims and objectives act as the basis for a value discussion through which teachers and parents define the attainable skills needed in the information society. Schools compile their own information strategies on the basis of these discussions. Thus, the value discussion on skills guides both teacher and pupil in defining the premises and the goals of planning (Figure 1). This would truly mean moving onto the threshold of a skills society.

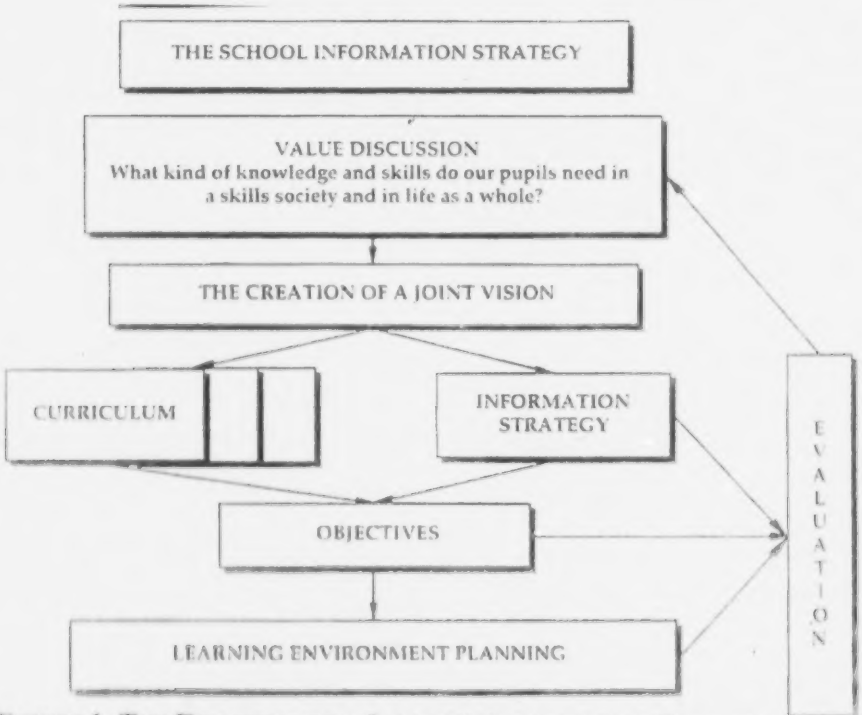

THE SCHOOL INFORMATION STRATEGY
VALUE DISCUSSION
What kind of knowledge and skills do our pupils need in a skills society and in life as a whole?
THE CREATION OF A JOINT VISION
CURRICULUM
INFORMATION STRATEGY
OBJECTIVES
LEARNING ENVIRONMENT PLANNING
EVALUATION

FIGURE 1. THE DRAFTING OF A SCHOOL'S INFORMATION STRATEGY

The training model of the Media Education Centre has adopted the concepts of teamwork and joint planning. Working practices have included co-operational models, discussions and learning by writing. Other methods have included conceptualisation and modelling, in which teachers participating in continuing education have, on the basis of their joint discussions, drawn maps and graphs of the learning environments at their schools. A similar steering model has been described by Peavey (1996), who has described this kind of awareness and expression of one's own thoughts by drawing or writing as autobiographical work and word-sculpturing:

> "In conceptual mapping, the client is encouraged to use a coloured pen or pencil and draw a map of his or her life-space in relation to a particular concern... This process of "mapping" consists of linking ideas and experiences, significant others and activities into patterns and relationships. Sometimes the counsellor and client work together on the task of mapping with the counsellor asking questions that clarify, challenge and help establish meanings..." (Peavey 1996, 11).

In this training model the supervisor aims at increasing the participants' awareness of their thoughts and objectives. At the same time the teachers take part in joint development discussions to become aware of each others' thoughts and emotions and thus work towards a shared comprehension. The main goal for these groups is continuing development within the school. Even though the model has only focused on development carried out by teachers, the influence of other groups, including head teachers and other administrative personnel, the parents and the pupils, cannot be seen as separate. The development of a school's information strategy is part of a new way for teachers to plan their work. Especially at the beginning there has to be enough

time for joint meetings, along with the possibility of free discussion and group interaction. In the model described, the change of planning practices in a more community-based direction has been one solution used for modelling the networking process. Network-based working methods associated with the pedagogic use of information and communication technologies require co-operational skills of the teachers; these skills can also be used in a number of virtual learning environments together with the pupils.

At its best, creating an information strategy for the school can be a step towards learning which renews organisations. The school finds itself a goal, a vision which becomes the focus for the school's activities. The continuous development and evaluation of the organisation's working processes are key characteristics of the strategy. On the level of the pupil, the information strategy can be viewed as a learning strategy for the individual pupil who, by setting his or her own objectives, aims at improving the quality of learning. The pupil returns again and again to the objectives set out at the start, evaluates the results of the learning process and sets new aims for development. The evaluation of objectives and learning results always includes the setting of a new development task. Thus the pupil and the school consciously aim at improving their study and work methods.

THE PLANNING PROCESS AND THE TEACHER

In this chapter, I shall describe the applications of the development projects at the Media Education Centre in which the teacher supervising teacher education, the student and the pupils together plan a teaching module. From the point of view of the supervisor, the aim of this process is to raise

the awareness of the students and pupils about their own ways of planning an open learning environment and expanding these methods.

Right from the beginning of teaching practice, the supervising teacher uses questions that support reflection to point out to the student fresh new points of view on the bases of planning. This awareness is supported by supervised discussions and learning by writing. To monitor their own learning, students write a process portfolio; at the beginning, they write about their most usual way of planning teaching. Students also analyse and model their thoughts by drawing. Students are guided to be aware of the premises of their own learning:

- How do you plan your teaching?
- How do you yourself learn best?
- How does the pupil learn best?
- How do you use experience gained from your own learning in your teaching work?

Teaching practice periods are carried out through teamwork: students work in pairs and then two pairs form a group of four, a 'tele-team'. The supervising teacher guides the students' teamwork. Following this initial stage, the working pairs continue their work as a planning process which can be divided into three phases: the analysis of openness, the planning of media choice, and the construction of the role of the learner and the teams.

An Analysis of Openness

During the first phase of planning, the supervising teacher and/or the students analyse the openness and flexibility of their teaching/study environments. In this context openness is seen as the student's choices in study situations. The analysis is based on three process-oriented questions and the structural aspects of openness, through which the teacher creates a holistic view of his or her teaching environment and consciously aims to change and develop it in the direction of openness for the learner:

- What is the study environment like now?
- What would be the optimal situation?
- How can we achieve the optimal situation?

The structural factors of an open learning environment—physical, didactic, psychological and virtual openness—are used as the contents of the analysis model. The structural factors included in an open learning environment are analysed through clarificatory questions (Sariola 1997, 76; also Race 1994, 11-12):

- Physical openness

– How can the facilities and furniture in a school be flexibly changed or removed? How can we access the various facilities? Are these facilities closed to the pupils or can they be freely used for various teaching and learning situations? Which factors prevent physical openness?

- Didactic openness

– How do people study? What choices are made regarding goals, working methods and evaluation? Who makes them?
– How much influence can students have on the pace and rhythm of their study processes? Who do they study with?

Didactic openness includes the social point of view about the composition and construction of a group. Didactic openness and flexibility have a direct impact on the planning of the other structural aspects. If the teacher does not provide the pupils with any choices or opportunities for decision-making in their studies, the following structural aspects, the psychological and virtual, cannot be actualised. Thus education and training should concentrate especially on didactic openness and the analysis and development of open learning in teaching.

• Psychological openness
– When and where do pupils study? Independence of time and space creates for the pupils a feeling of release and motivation for learning. Another area of psychological openness is to influence the learner's own learning methods, thus creating the feeling that the learner can truly influence his or her own learning. The degree of psychological openness can be ascertained through pupil interviews and/or by the pupils writing analyses of their learning processes based on methods previously used by the teacher.

• Virtual openness
– Which information and communication technology applications can be used in teaching?
– Which telematic levels, e. g. electronic mail, telefax, video conference, are in use?
– Which telematic media can best be applied to this teaching session? Why?

Physical and virtual openness is analysed and modelled by drawing spatial maps of the teaching facilities, thus enabling the student teacher to visualise the space as a whole (Figure 2).

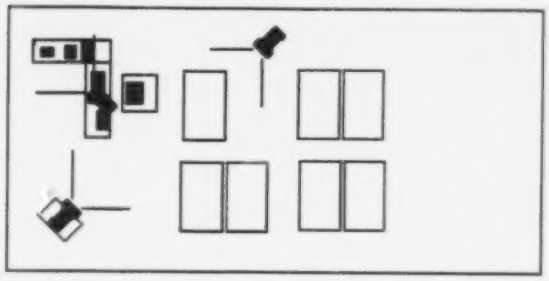


FIGURE 2. AN EXAMPLE OF A SPATIAL MAP OF A DISTANCE EDUCATION CLASSROOM.

The student uses the spatial map for further didactic analysis. How are the facilities organised from the point of view of teaching and studying? What does this tell about the teacher's teaching style and concept of learning? How would you alter this teaching space? Why?

> "I would have liked to have had a mobile screen in the distance education classroom at the training school that could have been used as the background when the pupils were shown a picture using the classroom camera. The classroom camera is a very functional object as one can programme several storage locations in it before the lesson begins and use it flexibly during the lesson. This kind of screen would be a quieting background for the picture and you could hang illustrations and mottoes on it." (Extract from a student's portfolio, 1997)

Why then are the teacher's ideas about openness and teaching choices so important? Openness can be interpreted as flexibility in the learning situation and the teacher's own didactic choices can have a crucial impact on the pupil's way of learning. The teacher is responsible for the kind of learning he or she guides the pupils towards, and, as Niemi (1992, 24) claims, if pupils cannot practice to make their own choices about how they study, or cannot set them-

selves learning goals, it will be difficult for them to practice active learning.

Planning Media Choices

The networks associated with an open and flexible study environment require the capacity of both teachers and pupils to realise the possibilities of information and communication technologies in obtaining, and managing and communicating information. Thus media choice is an integral part of learning situations.

Pohjonen and Karjalainen (1994) base educational planning on the situational process of media choice. Planners set themselves four basic questions on educational planning:

Who?
- This question includes the whole teaching staff from teachers to technical assistants, and, of course, those who are actually being educated.

What?
- The contents of teaching are built on the students' needs. Before the training period begins, the planning officer elucidates the educational needs and starting levels of incoming students.

How?
- The aim is to construct the active part of a teaching module, the actual work, as a versatile experience, thus enabling the student to practise various skills.

Why?

- The objectives of education define the directions in which the student should be heading. From the point of view of the impact of education it is, however, important to evaluate what kind of learning results are achieved. In this case the question 'why' is used to map out the qualitative aspects of education.

The above questions can be expanded by the approaches of didactic media choice. In planning, the teacher should consider how the chosen media supports the aims of teaching and learning and the openness of the learning environment. The added value to learning provided by the chosen media must also be evaluated.

Other media choice criteria include the availability of information, the ease of obtaining it, and the possibility to check the credibility of the source, and, from the perspective of human interaction, the possibility for large-scale communication between pupils. The use of several channels enhances interaction and ensures that information reaches its target even where one information channel is not in use (e.g. the principle of high communication proximity in Kincaid & Rogers 1981). This kind of multi-information situation is called the multi-channel strategy, in which the teacher and pupils try to enhance their communication through various media. One example could be the didactically argumented joint use of videoconferencing, the audio channel and the data channel (Sariola 1997, 77). As communication, this kind of strategy resembles the use of interactive multimedia in teaching, even though the interactive distance education situation is far more flexible. This model has been used in distance teaching practice organised by the Media Education Centre. When planning a distance teaching session, it is useful to separate all the various communication channels from each other, as has been discovered in

teaching practice sessions. This makes it easier for the teacher to figure out which communication channel is the most desirable, and, on the other hand, which communication channels can be used together for optimal interactional support. The communicative elements of the plan are similar to the planning model for a CD-ROM designed by Jukka Packalen, multimedia educator at the University of Helsinki (Figure 3).

CONTENTS	IMAGE	ANIMA-TION	SPEAK	SCREEN TEXT	EFFECTS	SCRIPT
Today....					lightning	

FIGURE 3. AN EXAMPLE OF A PLANNING MODEL FOR A CD-ROM (PACKALEN 1996).

In the planning of a teaching session, the didactic structure and the versatile use of various communication channels become emphasised (Figure 4). Such a polysemic approach (see also Härkönen 1994) requires of the planner, besides didactic knowledge, knowledge of visual, lighting and audio design. From the point of view of the learner, the emphasis in various study environments is on skills in multimedia literacy, i.e. simultaneous reading and writing skills in several media. Such learning environments include the video conference, CD-ROM and WWW environments (Sariola 1997, 78), as well as all mediated learning environments based on the principle of dialogic communication (cf. Tella & Mononen-Aaltonen 1998, in press).

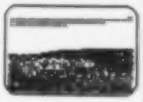
TEACHING SEQUENCES	AUDIO	MOVING IMAGE	GRAPHICS	EMAIL	WWW
Pupils draw the view from the window of Ruskela school. The screen shows a picture of the surroundings of Kilpisjärvi school...	Music: BACH		Handing out assignments: 1...	Extra assign-ments	Nature topic

FIGURE 4. AN EXAMPLE OF A PLANNING MODEL FOR A DISTANCE EDUCATION TEACHING SESSION.

The strength of the planning model described above lies in its structure and its analytic structuring, which takes most key elements into account. Each communication channel is given its own task, thus making it easier for the teacher to see how these channels support each other. The weakness of this plan is that open learning situations should allow influence from the pupils concerning their rhythm of learning, and also permit the pupils to choose various media to support their studies.

From the point of view of the teacher, a plan for open and distance teaching requires on the one hand a clear, careful analysis of the communication channels, but on the other hand great flexibility in teaching situations. Nevertheless, a solution can be found for this slightly paradoxical approach: the pupils should be able to influence the planning process at an early stage. This plan will not fetter learning but form a firm basis for it—the old didactic truth also applies here: natural situational improvisation during a lesson is mainly based on careful advance planning.

The Construction of the Learner's Role

This chapter will focus on the final part of the teacher's planning work, the construction of the learner's role, the aim of which is to consciously create an active role for the pupil in a study situation. The construction of roles is connected with interaction and the acknowledgement of group dynamics in learning situations. The interactional relationships between the teacher and the pupils and the social dynamic between the pupils act as a strong inner influence on learning (Sahlberg & Leppilampi 1994, 91). Network activities include telematic interaction between the pupils, thus enhancing their co-operational skills, for instance the skill of discussing a matter on a digital telephone, or writing an electronic mail message for the group. To simplify: the most active pupil learns the most: I speak, therefore I learn. From this point of view, the emphasis falls on the construction of active roles for the pupils. The active role of the pupil will not, however, be realised unless teachers themselves are aware of the significance of activity in interaction and learning. Hence we have to ask: how does the teacher influence the emergence of openness and choices?

Before teaching, the teacher should clarify the following didactic aspects:

- What skills does the learner have in the choice and use of various media?
- Which method of network learning is used, and why?

The previous question is connected with, on one hand, co-operational, and on the other hand individual work, along with the development of interactive skills.

- How do learners evaluate choices connected to their studies or their learning processes?
- How can each pupil's active participation be ensured?

The above questions act as examples for supervising teachers and student teachers. The best experience provided by the use of these questions has been gained through portfolio work with the students first writing down their own points of view regarding the questions, and then using the text with their working partners to compile a list of key points of view concerning their own teaching. The working pair has presented a summary of their thoughts and the rest of the teleteam have commented on what they have heard. After these discussions students often start to pose themselves problem-based questions and discuss them in their portfolios.

To ensure the quality of the supervision of teaching practice, it has been considered important to return to the questions written earlier and to compare how and why the setting of these questions has changed. Thus the student teacher has practised the analysis of a didactic process.

Applications of Planning

In the beginning of the pedagogic applications within media education studies and teaching practice in general, students have in their joint planning sessions used the 'From Idea to Teaching' planning model. The meaning of the figure is to provide the teacher with a tool for the brainstorming phase of planning in order to be able to figure out the didactic elements of the upcoming teaching situation (Figure 5).

FROM IDEA TO TEACHING		
1. The topic/theme of the teaching module Media in people's everyday lives		
2. Subjects Mother tongue, history, arts, music, foreign languages		
3. Contents Information and communication technology, media education, various media, the child, the adult, young people, interactive software, games...		
4. Working methods Individual work, dyadic work, interviews, street poll...		
5. Information and communication technology (media choice) Electronic mail, fax, video conference, audio conference, mobile media		
6. Evaluation Self-evaluation, pair evaluation, process evaluation, portfolio, essay		
7. Aims		
Cognitive	Affective	Social

FIGURE 5. AN EXAMPLE OF THE 'FROM IDEA TO TEACHING' PLANNING MODEL.

Planning Phases:

1. Choice of theme
First the teachers choose the topic or theme of the upcoming teaching module on the basis of the curriculum.

2. Brainstorming
The group freely creates ideas about which subjects this theme could be integrated with. The planning is continued in a brainstorming session in such a way that teachers/students say out loud and write down everything that comes to mind about the contents of the chosen theme. The same is done with working and evaluation methods. All suggestions are accepted and written down. The information and communication technology part is filled with ideas about how various telematic equipment can be used in study situations.

3. Selecting and choosing
After the brainstorming session the group chooses the key contents of the topic and theme and aims at choosing working methods that would best support the actualisation of the contents. The main objectives of the teaching module are written down according to the chosen contents, and the evaluation methods are chosen. The From Idea to Teaching planning model acts as a tool for the first phase of planning, after which the group of teachers drafts the actual plan.

Another planning model, the analysis model for the openness of teaching, can either be drafted in the planning phase before actual teaching has begun, or while observing actual teaching. The model is based on the aforementioned structural aspects of an open learning environment.

THE ANALYSIS OF OPENNESS IN A TEACHING PROCESS
1. Actual teaching
2. Choices
3. The nature of openness

FIGURE 6. AN ANALYSIS MODEL FOR THE OPENNESS OF TEACHING.

Students write down the whole teaching session process in advance in the 'Actual teaching' space. At the same time, students fill in the 'Choices' point with those concrete choices they anticipate during the teaching session. The last phase is to mark down which structural aspect of openness each choice is connected with (physical, didactic, psychological, virtual). When the writing task is finished it will form a basis for discussions about the student's observations: which structural factor he or she bases his or her teaching on and why. In supervised discussions the student produces arguments in support of his or her choices.

With the aid of the two models described above, the teacher educator and student teacher can, before teaching has even begun, compile a whole teaching event on the basis of their own knowledge. At the same time the teaching solutions marked down by the student also become visible. The models help the supervisor to see the strengths and development areas in the student's plan. Plans should act as flexible frameworks within which the student builds up the teaching event with the pupils.

VISIONS FOR THE FUTURE OF TEACHER EDUCATION

How should the study environment created by teacher education change if all the information in the world were to be available in the student's pocket? The wildest visions of the development of information and communication technologies can already be read in the advertisement brochures of large telecommunications companies. Whether we like it or not, it is the market which takes care of the sale of the latest telematic equipment. It is therefore worth considering how teacher education could respond to this rapid technical development from the perspective of media education and educational research. In the following, I shall describe some technical solutions of the near future (McClelland 1997, 297–311) and their possible impact on teacher education and teaching work in an open learning environment.

• Hardware and equipment become smaller
From the point of view of the planning of teaching, this means the portability of equipment, and also student group mobility from one place to another carrying portable media with them; the increase of independence of place will have an impact on the shift of the control of study from teacher to pupil. It will become easier for the pupils to communicate from places of their own choosing.

• The use of wideband channel technology
The latest wideband channel technology enables the simultaneous use of, for instance, the telephone and electronic mail within the same mobile phone. In study situations students communicate simultaneously through several media, for example the fax, electronic mail, or video or audio conferences. Here teachers and pupils need knowledge about the bases of media choice and the characteristics of each medium. In video conferences students are able to visually illustrate their learning materials; on the other hand, the use of short messages with mobile media enable the rapid and cheap transfer of messages even to the other side of the world. It can be presumed that the use of several communication channels enhances interaction between pupils. This can also have effects on the quality and quantity of learning.

• The growth of data transfer rate
The use of a faster data transfer rate (over 164Kb/s) in integrated mobile media will open up new possibilities for using, for instance, portable video conference for different subjects. These applications can include themes in comparative geography and biology. The ability to watch and comment on images presented directly from nature in real time expands the borders of the physical school in the direction of the virtual school (Nummi, Rönkä & Sariola 1997, 168).

The increase in data transfer speed will also enable the use of multimedia characteristics in study.

The use of still images, video images, sound and hypertext requires the skill to plan interactive material from both teacher and student. As the increase of data transfer speed will increase the use of multimedia in the Internet, it will at the same time lead to growing visuality.

The design of visual material, the choice of camera angles, image framing, rotations and the use of colour in a digital environment are skills that should be provided to future teachers.

The latest information and communication technology will enable the use of a portable digital portfolio. When studying, the students will carry a telematic portfolio which fits inside the pocket and collect learning material in digital form at the physical or virtual place of their choice. After this they will choose from their portfolios the documents that have best enhanced their learning, use them to reflect on what they have learned, and send the material to the whole tutorial group for comments. The group will have access to groupwork software with multimedia options. Students will present their portfolios to the group by using their mobile media, and the group will comment on what they see and hear by using the communication channel of their choice. The feedback will act as a basis on which the individual student can clarify his or her learning objectives and set himself or herself the next pedagogic development task.

During the process described above—collect, select, reflect, present, perfect—the students, the tutorial groups and the supervisor form a telematic group of experts, make use of the range of media according to each study situation, and

further develop their co-operational skills. The study environments of teacher education become mobile, flexible virtual universities in which nomadic students choose the study modules within the net. The evaluation of virtual study will increasingly change in the direction of process evaluation and actualise as interactive network portfolios. To enable this kind of change, we have to ask the question: is the school used to discussing student work? (Niguidula 1997, 28). What kind of criteria should be set for a portfolio? How do teacher educators guide their students in portfolio work?

Another significant trend for the changing teacher education will be the extensive use of interactive groupware in study. From the point of view of working methods this means the practice of co-operational skills in both physical and virtual environments.

The key factors of change affecting the technical and pedagogic visions presented above are the Internet and mobility. From the point of view of teacher education, however, the most interesting aspect is their joint effect on study and learning. One possibility is the strongly increasing use of digital portfolios, which will also lead to new changes in our evaluation culture. On the other hand, digital nomadisation tells about the student's metaskills, such as planning and evaluation skills. These kinds of skills include obtaining and managing information, and communication skills. In the virtual degree diploma of a future teacher education student, portfolio skills could include skills in obtaining and managing information, and in information and communication technology.

Even though McClelland's (1997) description of technical development, as cited above, provides plenty of ideas for the planning of an open learning environment, in teacher

education we have to return to the basic question of how the student can become aware of and develop his or her own way of planning teaching. The combining of research and development in student supervision will become the criteria of high-quality teacher education. The latest research information within the field of media education and the goals of education will become visible in the student's portable portfolios as multimedia productions.

Variations of Co-Operative Learning: An Analysis of Four Different Approaches

Anne Vähäpassi

The purpose of the article is to give an overall idea of co-operative learning. Co-operative learning can be seen as a generic concept, which includes several methods of organising the learning environment. It is usually defined by a set of processes or step-by-step methods which help students interact together in order to accomplish a task, gain a specific goal or develop an end product. The students work in small groups and the co-operation is used to help the individuals learn better. Students co-operate to construct their knowledge. In the beginning of the article there is a brief summary on the history of co-operative learning in the Finnish context.

Four different approaches have been chosen for further analysis to represent various dimensions of co-operative learning models: Learning Together, Structural Approach to Co-Operative Learning, Complex Instruction and Group Investigation.

Key words: Co-Operative learning; Learning Together; Structural Approach to Co-Operative Learning; Complex Instruction; Group Investigation.

CO-OPERATIVE LEARNING IN FINLAND

One of the first persons to introduce co-operative learning to Finland was Viljo Kohonen, who had learnt about it in the USA in 1988-89 as a visiting researcher in California. Primarily on his initiative, the first workshops, articles and books about co-operative learning emerged at the beginning of the 1990s in Finland. David and Roger Johnson gave the first few international workshops, and their approach to co-operative learning was the first model that was used in Finland extensively. Other models introduced later were those by Elizabeth Cohen (Complex Instruction), Yael and Shlomo Sharan (Group Investigation), and the community learning approaches by Bruce Joyce and Nancy Schniedewind. Rather than adhering to any one model, cooperative learning has been developed in Finland as a conscious attempt to cover a wide range of different approaches, for a deeper understanding of the possibilities of co-operative learning in student learning and the teacher's professional development. (Kohonen 1998) One practical application has been used more than any other in Finland, the Jigsaw method, originally created by Aronson and associates at the end of the 1970s. For many teachers, there has been like an equivalence between the two—co-operative learning for them is equal to Jigsaw. The first books on co-operative learning in Finnish were published in 1993 (Koppinen & Pollari) and 1994 (Sahlberg & Leppilampi).

In this article, I discuss first the *Johnsons' model Learning Together*, because their philosophy of developing group dynamics based on five basic principles is widely applicable in any co-operative learning situation. Second, I will introduce *Kagan's Structural Approach to Co-Operative Learning*, since it provides an easy to apply approach to start building

awareness and consideration of others in the group and the whole class. Among the four approaches chosen for the analysis, it is the least known in Finland. The third model, *Cohen's Complex Instruction* implies a notable respect for every student, irrespective of his/her background and academic abilities. There is much to be learnt from her belief in a student. At the end I will describe briefly the *Sharans' Group Investigation*. The traces of the two latter ones are mostly recognisable in the LIVE Project. I hope that these four approaches will give the reader an idea about the versatility of co-operative learning.

Learning Together

The Learning Together approach has been originally created by David and Roger Johnson and later developed futher together with their sister Edythe Holubec. (Johnson, D. W. & Johnson, R. 1987; Johnson, D. W., Johnson, R. & Holubec, E. 1990). The Johnsons merged their initial findings of the interaction between theory, research and practice.

> "First came a review that synthesized the results of research on cooperative learning to determine the current state of knowledge in the area. (...) Second, a series of theoretical models was formulated based on the results of the previous research and theorizing of Morton Deutsch. Third, we conducted a program of research to validate our theory. Fourth, based on the theory supported by the research, a series of procedures was devised for teachers [and administrators]. Fifth, school districts in many countries were trained to implement cooperative learning." (Johnson, D. W. & Johnson, R. 1994, 50–51)

Each co-operative lesson or activity should include the five principles, essential components that make the co-operation work: positive interdependence, face-to-face promotive interaction, individual accountability, social skills, and group processing.

According to the Johnsons, both the repetitive, routine lessons as well as classroom routines should be co-operative. This is to ensure that teachers use co-operative learning enough to reach a routine-use level of competence. Even the organisational structure of schools should be changed from a competitive/individualistic mass-production structure to a co-operative team-based structure. (Johnson, D. W. & Johnson, R. 1994, 51) The latter claim has been supported by the research of e.g. Shlomo Sharan and Hana Shachar (cf. 1995, 47–63).

As the first and most important step in promoting co-operation among students the Johnsons consider structuring positive interdependence. It exists, when each student has a feeling that s/he is linked with others—one cannot succeed unless others do and vice versa. Students must co-ordinate their individual efforts with the efforts of the others to complete the task successfully. (Johnson, D. & Johnson, R. 1990, 27)

To establish positive interdependence among the students, the teacher has to provide face-to-face promotive interaction. The verbal and non-verbal responses from other group members is a source of continuous feedback for a student. Silent students are seen as uninvolved ones who do not contribute to the learning process of others nor to that of themselves in an effective way. (Johnson, D. & Johnson, R. 1994, 58)

Individual accountability exists when the performance of each individual student is assessed and the results are given back both to the group and the individual. Contrary to traditional group work, nobody is allowed to "hitchhike" on the work of others. Ultimately, students learn together in order to gradually be able to perform better and better as individuals. To ensure this, students are held individually accountable for their work and learning. In the Learning together -method, common ways of ensuring this are giving an individual test to each student, randomly selecting one student's product to represent the entire group, or asking each student to explain to classmates what s/he has learned. (Johnson, D. & Johnson, R. 1994, 58)

The success of co-operative learning requires inter-personal and small-group skills. Students must be taught social skills for high-quality co-operation and they must be motivated to use them. Leadership, decision-making, trust-building, communication, and conflict-management skills have to be taught along with academic skills.

At least in the end and also during the co-operative learning process the students must be given time and guidance for analysing how well the groups are functioning. The group processing involves both the social skills and academic achievement in the groups. This is one of the keys to successful progress in co-operative learning. (Johnson, D. & Johnson, R. 1994, 59)

According to the Johnsons, three types of co-operative learning procedures should be used in an integrative way: formal co-operative learning, informal co-operative learning, and co-operative base groups. (Johnson, D. & Johnson, R. 1994, 52–54)

In formal co-operative learning students are working together for durations of one class period to several weeks to achieve shared learning goals and complete specific tasks and assignments. Any assignment can be reformulated as co-operative.

In informal co-operative learning students work together on a temporary basis to achieve a joint learning goal. These *ad hoc* groups last from a few minutes to one class period. Informal co-operative learning can be used to focus students' attention on the study material or topic of the class. Perhaps the most common way in Finland to do this is to engage students in focused discussions for a few minutes on a "turn-to-your-partner" -basis, which can be interspersed throughout a traditional lecture.

Co-operative base groups are usually long-term, heterogeneous co-operative learning groups in which the members stay on a permanent basis from one to several years. In Finnish, the term *kotiryhmä* is used. The purpose of the base group is to give support, help, feedback and any kind of assistance to its members. The aim is to develop cognitively and socially in healthy ways.

My opinion is that to a great extent this model is curriculum-based and it applies a behaviouristic approach to learning. The teacher defines the instructional objectives and makes preinstructional decisions. The tasks are closed, not open problem-solving approaches (cf. Cohen) nor the students can choose what they investigate (cf. Sharan). Individual accountability (as described above) can be used as a stick, a threat for a student—to ensure the individual learning outcomes and using them as an example of the group's learning may take the focus from collaborative learning towards group and individual learning. Especially, if the groups are competing against each other, the oppor-

tunity for whole society learning may be lost. The Johnsons also give explicit advice to the teachers how to plan, what to control and how to intervene in the groups' work. In this sense, Cohen's approach at in the other end of the spectrum, where she appoints the autonomy to the groups. But before going into that, it would be appropriate to introduce Kagan's Structural Approach to Co-Operative Learning.

Structural Approach to Co-Operative Learning

Spencer Kagan describes his Structural Approach to Co-Operative learning as being based on the creation, analysis and systematic application of structures, which are content-free ways of organising social interaction in the classroom.

> "It is relatively easy for teachers and students to learn various social interaction sequences, called 'structures'. Because these structures have different learning outcomes, the teacher who knows and uses a range of structures can efficiently produce specific academic, cognitive, and social outcomes among students. (...) Understanding and use of structures complements other approaches to cooperative learning." (Kagan, S. & Kagan, M. 1994, 115–116)

There are six key components of the Structural Approach to Co-Operative Learning, which are (1) structures and related constructs, (2) basic principles, (3) teambuilding and classbuilding, (4) teams, (5) management, and (6) social skills.

The first key component refers to the basic premise of the structural approach, which emphasises the strong relationship between what students do and what they learn (Kagan, S. & Kagan, M. 1994, 115). Spencer Kagan makes a clear division between structures and activities. Activities carry

content but structures are content-free, they do not get "used-up". Each structure has distinct domains of usefulness and can more efficiently reach some but not other cognitive, academic, and social goals. Different structures exercise different skills and they can be divided into groups according to their objective:

• Teambuilding
- getting students acquainted with each other
- building mutual support within teams
e.g. Brainstorming, Round table

• Classbuilding
- creating a positive classroom climate
e.g. Corners, Find-Someone-Who

• Communication building
- learning how to communicate effectively
e.g. Consensus Seeking, Broken Squares

• Mastery
- acquiring basic skills
e.g. Mix-Freeze-Group, Numbered Heads Together

• Concept development
- acquiring higher order thinking skills
e.g. Think-Pair-Share, Venn Diagrams
(cf. Kagan 1992 for more structures)

With the second key component, basic principles, Spencer Kagan refers to simultaneous interaction, equal participation, positive interdependence, and individual accountability. Almost all of the structures have these elements built in. (Kagan, S. & Kagan, M. 1994, 125–126) In this sense, Structural Approach shares the same elements as all the three other methods that are discussed in this article.

The third key, teambuilding and classbuilding, means the constant work that the teacher should do with the students— creating the social atmosphere in the classroom as positive and supportive as possible. The aims of teambuilding are: getting acquainted, team identity, mutual support, valuing differences, and developing synergy. Although students spend most of their time in smaller teams in the co-operative classroom, it is important that the students see themselves as part of the class as well. (Kagan, S. & Kagan, M. 1994, 129–130) With this statement the Kagans seem to expand their thinking from groups towards a more collaborative approach.

Teams are not the same as groups. The latter have no identity and they do not necessarily endure over time. A co-operative learning team has a strong, positive team identity, it ideally consists of four members, and does endure over time. The four most common co-operative arrangements are heterogeneous teams, random groups, interest teams and homogeneous language teams. Kagan recommends that teachers use different kinds of team-formation methods, whereas e.g. Cohen stresses the importance of heterogeneous teams only.

The fifth key, management, refers to the need to change the management style of the teacher in a co-operative classroom. Once the students have been given permission to talk and work together, traditional whole class teaching methods are no longer of much use. Kagan gives practical tips to teachers on how to solve these problems with quiet signals, classroom arrangements etc.

The social skills key component includes ways of enhancing the acquisition of social skills among the students. The important elements are roles and gambits, modelling and reinforcement, structures and structuring, and reflection and planning time. The students are supposed to learn the skills, not just learn about them. (Kagan, S. & Kagan, M. 1994, 130–133) Spencer Kagan puts great emphasis on developing social skills in the students. This is a distinctive difference between traditional group-work and co-operative learning: not any group of students is seen as a team or collaboratively working group, but the skills must be exercised.

Kagan has found the structures as an effective way for in-service training: "It is hard to teach teachers use cooperative learning, but easy to train one structure." In this way, co-operative learning is being learned in small doses, a structure at a time. Kagan says he was inspired by Shlomo Sharan's vision of co-operative learning which includes a concern for the total education of the student. Kagan claims that his Co-op Co-op structure and Sharan's Group Investigation were developed independently, even if they share a similar philosophy and structure. (Kagan 1992, xiv)

From my point of view, the Structural Approach to co-operative learning gives teachers an opportunity to "adopt the practice before theory"—taken that they have internalised the idea of co-operative learning being valuable for their students and suiting their concept of knowledge and learning. It has been criticised in Finland for being too much like a "recipe book" and more theoretical and scientific approaches have been considered more valuable. The next two methods are examples of those.

Complex Instruction

Complex Instruction was designed to develop higher-order thinking in academically heterogeneous classrooms. The main researcher and developer of the method, Professor Elizabeth Cohen emphasises the problem of status issues in the classrooms.

> "Status problems can lead to learning problems. Research on Complex Instruction has shown that the rate of interaction in the group is a strong predictor of learning gains. (...) As high status students interact more in the group, they learn more from the task; as low-status students interact less, they in turn learn less. (...) Complex Instruction offers two strategies to treat status problems in the classroom: (a) the multible abilities status treatment and (b) assigning competence to low status students." (Cohen et al. 1994, 85)

Multiple-abilities treatment is based on Gardner's theory of multiple intelligence. The tasks or problems for the co-operative, heterogeneous groups are always created so open that the students can and have to use a variety of skills to be able to solve them. The teacher starts by naming the different skills and abilities necessary for successful completion of the task. Then s/he shows the relevance of the abilities to the task. The teacher stresses the fact that no one has all the abilities necessary for the assignment but everyone has some of them. This can be seen as one of the central ideas in Complex Instruction: Co-operate because you need each other. (Cohen et al. 1994, 82–86)

Assigning competence to low-status students means that the teacher recognises and makes a public statement about the work they have accomplished. Obviously the teacher can assign competence to any student in the classroom, but Cohen recommends especially focusing attention on low-status students. There is a special programme based on the

ideas of Complex Instruction, Finding out/Descubrimiento, an English-Spanish math and science curriculum for the elementary grades. It carries a double title, because it was developed for schools where children have different language backgrounds. The notion that "the rich get richer while the poor get poorer" is noticeable in the schools, where insufficient language abilities hinder equal participation in the instruction and conversation. The research done on Complex Instruction indicates that the more students talk and work together, the more they learn. (Cohen et al. 1994, 91)

As with other models of co-operative learning, Complex Instruction stresses the preparation of students for the co-operation, selected skill-building activities, which are needed for working in the small groups. The two essential norms are: "You have the right to ask anyone in your group for assistance," and "You have the duty to assist anyone in your group who asks for help."

What distinguishes Complex Instruction most from the previous two methods described in this article so far is the issue of authority. The Johnsons clearly define the role of the teacher to plan, assign specific tasks and task-oriented roles for the students, control, and assess the outcomes. In Complex Instruction delegation of authority is supported by giving each student a procedural role to play, e.g. facilitator (this one is always used), safety officer, harmoniser, materials manager and recorder/reporter. It is seen as important to rotate these roles so that everyone gets a chance to play every role. The roles are not designed for the division of work that would allow the students to divide their jobs. Roles are designed to encourage interaction and discussion and to take care of the work and progress of the group. Here again, it is not enough to assign the roles, but they must be discussed, followed and the teacher should

watch out that the most dominant students do not take away roles from the quiet ones. (Cohen et al. 1994, 88–89)

In Complex Instruction the teacher is supposed to avoid hovering over the groups and giving them detailed directions while they are at work. The research of Cohen and her group has shown that direct instruction through verbal presentations and directions by the teacher cuts down on the amount of students' talking and working together. They also found out that it is highly desirable to have more than 35% of the students interact at any time. The management system frees the teacher to play a more sophisticated instructional role: while students are at working stations, s/he devotes time to asking higher-order questions, extending the group's thinking on its activities and taking care of status problems. During orientation and wrap-up the teacher summarises, makes connections, provides information and frames the overall lesson. (Cohen et al. 1994, 90)

Delegating authority to the groups does not mean giving up the control in the classroom, but making the groups responsible for it. Cohen insists on both individual and group accountability. The individual reports provide each student an opportunity to demonstrate what s/he has learnt. (This has also been used in the teaching practice in the LIVE Project. Even if the students are expected to work in co-operative teams, each one of them is expected to compile his or her individual portfolio.)

What is similar in the way of organising the LIVE Project group work and Complex Instruction is the curricular approach. By this I refer to the principle that the activities are organised around a central concept or "big idea" than a narrow topic in e.g. a textbook. The activities are open-ended both in their solution and the process by which the teams and groups reach the solution. The students can use

multiple intellectual abilities to complete the tasks. Perhaps this aspect could be emphasised even more deliberately.

Group Investigation

The creators of Group Investigation, Yael and Shlomo Sharan (1992, ix) give a definition of the method in a nutshell:

> "Group Investigation is a co-operative learning strategy that integrates interaction and communication in the classroom with the process of academic inquiry. It enables the classroom to become a social system built on co-operation among students in small groups and on co-ordination between groups in the classroom."

Four basic elements distinguish the Group Investigation method: investigation, interaction, interpretation, and intrinsic motivation. They all occur simultaneously, but the fourth element, intrinsic motivation has a somewhat different status than the other three elements; it can be seen as a result of the other three. (Sharan, S. 1995, 253)

In planning and carrying out Group Investigation, students progress through a series of six consecutive stages which are described below. As students proceed from stage to stage, they move back and forth among whole-class planning, individual study, group planning, and group study. To start the investigation, the teacher is supposed to present a broad, general problem, which should interest the whole class. Inquiry may be further stimulated by having the students scan through a variety of sources, texts, picture books, films, magazines, etc. The purpose is to help the students to see what they already know about the topic as well as what is unknown to them. The basic question is: What would you like to know about it? Then the stages proceed as follows (Sharan, Y. & Sharan, S. 1992, 71–73):

Stage 1. Class determines subtopics and organises into research groups
Students scan sources, propose questions, and sort them into categories. These categories will be the subtopics of the investigation. Each student chooses a part of the problem and joins the group gathered around the theme.

Stage 2. Groups plan their investigations
Group members plan their investigation co-operatively; they decide what they will investigate, how they will go about it and how they will divide the work among themselves.

Stage 3. Groups carry out their investigations
Group members gather, organise, and analyse information from several sources. They pool their findings and draw conclusions. The basic aim is to exchange ideas and information, and to expand, clarify and integrate them.

Stage 4. Groups plan their presentations
Presentations are made to the class in different ways. The audience evaluates the clarity and appeal of each presentation.

Stage 6. Teacher and students evaluate the projects
Teacher and students collaborate to evaluate individual, group, and classwide learning. Evaluation includes assessment of higher order thinking processes.

The teacher has a steering committee, which includes a representative from all the groups. The committee will discuss the problems, plan timing and act as an informative body between students, groups and the teacher. The role of the teacher is to lead the introductory discussions that will eventually lead to determining the subtopics, s/he facilitates the awareness of interesting aspects, and helps to find

source materials. The teacher is also supposed to help with study skills and to help the groups maintain co-operative group norms. The teacher is the co-ordinator of the presentations, conductor of feedback discussions and one of the evaluators in the course of and at the end of the group investigation process. (Sharan, Y. & Sharan, S. 1992, 95)

Shlomo Sharan and his associates have conducted more than ten large-scale experiments on the effectiveness of co-operative learning in general and Group Investigation in particular. Five of the studies assessed students' achievements at both the elementary and secondary level. Students from Group Investigation classes generally demonstrated a higher level of academic achievement than did their peers taught with the whole class method. (cf. e.g. Sharan, S. & Shachar 1988; Sharan, S. & Shaulov 1989) Other areas of interest have been to study students' spoken language (Shachar & Sharan, S. 1994), social interaction (Sharan, S. & Rich 1984) and teachers' reactions to an instructional change programme to implement co-operative learning in elementary schools (Sharan, S. & Hertz-Lazarowitz 1982). The methods and results of these researches are summarised in Finnish in the book written by Sahlberg and Leppilampi (1994).

One of the studies showed that there were significant changes in the level of motivation over the course of the year among the students in classes taught with the Group Investigation method compared to the students who studied with the whole class method. The students from the Group Investigation classes revealed a large increase in their motivation to learn over the course of the year. (Sharan, S. & Shaulov 1992)

Summary

In this article I have tried to introduce some methods or strategies of co-operative learning. In doing so, I want to emphasise that there are certain similarities among them as well as differences. They all share the basic concepts of co-operative learning: positive interdependence, individual accountability and the importance of social skills. The differences occur in the areas of teacher's role, the autonomy of the learner and flexibility.

David and Roger Johnson's approach can be seen as flexible, if you only consider the basic principles of Learning Together. It becomes very authoritarian if you read their instructions for the teacher about his/her duties in the learning process. The Johnsons accept different kinds of groupings, there is no such thing as only one principle in the forming of the group.

Spencer Kagan has created Structures where the basic idea of co-operative learning, sharing with others, has been built in. What is positive about them is the applicability to various situations. They can be used in any circumstances when teaching students social skills.

Elizabeth Cohen delegates the authority to the groups, who should primarily solve their problems themselves without the teacher intervening. The complexity of the learning tasks is the means or the vehicle by which the model aims at raising the status of the low-achievers in the class. Cohen emphasises the importance of setting high expectations for all students, not just the best ones.

Yael and Shlomo Sharan use Group Investigation to teach students independence while working with the tasks that they have been able to define themselves. The academic

content of the investigation is as important as the social aspects of group work. The social skills must be well practised before starting the group investigation, even if the skills will be monitored and practised along the way. In this the teacher's role is important. If s/he plays a dominant role, there is not much difference in this method compared with traditional group work. The teacher should act as a resource person, guide, consultant and classroom manager when the need arises. The teacher also co-ordinates the activities of all the groups in the classroom.

The latter aspect gives the opportunity for the LIVE Project to develop co-operative learning towards collaboration, seen not only as different groups working together but expanding the Group Investigation to the surrounding society. As its best, students learn for life, both as to the contents of learning and as a way of acquiring knowledge. From small scale tasks the students' investigations may grow to projects which include the spirit and methods of scientific inquiry.

Lifelong learning skills should be much practised in school in order to establish permanent learning strategies for students. Von Wright (1996) also stresses the importance of small groups where there is social interaction between learners. While reasoning and describing their thinking, the students become aware of their own interpretations and learn to reflect them. The teacher acts as a model, as a person who challenges the students' thinking. The experiences so far show that the LIVE Project has acted as a motor in the process where the teachers' and the student teachers' thinking is and has been under transformation. They are co-learners and as such, integral parts of the learning group.

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What the LIVE Project Tells us About the Nature of the School

Heikki Kynäslahti

In this article I investigate school as a spatially and temporally isolated and functionally differentiated institution, and I discuss how the LIVE project might change our understanding of it. I also discuss the concept of the virtual school and speculate with the idea of using cyborgs in the school context.

Keywords: School; virtual school; deterritorialisation; translocal field; cyborg; information society.

SCHOOL, TIME AND PLACE

The LIVE project challenges us to reconsider the nature of the school as a place devoted to education, a place where the outside reality is processed with a certain delay. The school, both as an organisation and as a building, has been differentiated by society to take care of the education of new generations. A school may be said to include a piece of land, a building, the personnel dedicated to their specific task, and the pupils. In other words, school education has been concentrated on a place, on a building and a location. From this perspective a school appears to be an organisation that is differentiated both functionally and physically.

Traditionally, some elements of the outer world are brought to the school. Pupils read books, listen and tell stories, look at pictures or videotapes, and so on, in order to consider

what it is like outside the school. Lauren Resnick argues in her 'Learning in School and Out' (Resnick 1987) that a school is 'a special place and time for people' and that there is a specific discontinuance between school and people's daily lives. She claims that learning is often symbol-based in school while outside of it actions are intimately connected with objects and events. In school, Resnick says, isolated activities take place using symbols which are divorced from experience.

When we think about the tools with which outside reality is brought into a school we notice that these tools are products of delay. Books are written at least one year earlier, pictures and slides which are presented in the school have been taken one week ago, five years ago... A lot of activities in school take place after a certain delay. Even narratives that are told in school often bear past character: "When I was in Stockholm...", "When our school visited the Parliament House..." Even things that are (at the very moment when they are being talked about) outside of school are treated in the past tense. The question then is about a certain kind of simulation geared towards things of the past. Outside reality is rebuilt inside the walls of a school by using images and symbols through abstraction from the real context and current time.

Another point related to temporal and spatial considerations deal with going and coming. It is not unusual that pupils and teachers go out of a school to study things. Excursions are a traditional way to organise school work. But, we could argue, excursions also manifest a feeling of going and coming back. Often, but not always, things are not merely studied in the field but only on returning to the school. People go out to make observations, to interview people, or to sample material which they bring back to the school, and so on. After the excursion, these materials are processed

and experiences discussed inside the four walls of a classroom: "What did we see on our trip to ..." Again, the world outside is brought into the school with a delay.

SCHOOL IN THE INTERACTION OF SOCIETY AND TECHNOLOGY

When discussing the development of school and classroom, Reid (1990) reveals how they as organisational settings have been 'inventions' of their time reflecting larger social developments. As an invention

> "... [i]t has to fit with theories of practice and with social relations and conventions. More than this, if is an educational invention it has to mesh with the meanings which the world outside schools projects upon it." (Reid 1990, 210)

While discussing the use of technology in education Hank Bromley considers in his excellent article (1997) the interaction between society and technology. He does not emphasise technological determinism over social determinants nor does he regard technology as a neutral tool. Instead, Bromley suggests that technology is influenced by the surrounding society and that technology, in turn, causes social impacts. The causality here then follows the schema: society—technology—society.

It is not difficult to guess that with previous paragraphs I am shifting the focus here towards the possible changes in our school as reflections of the changes in our society (often discussed under the title 'information society') and developments in modern information and communication technologies (MICT). Indications of these changes keep emerging here and there, the LIVE project being one of them.

THE VIRTUAL SCHOOL

First, a few remarks about the terminology. The word 'virtual' is being used increasingly nowadays. In education, such terms as virtual classroom, virtual school and virtual university or campus are often used, perhaps not, although, very often defined. I have favoured the term virtual classroom (Kynäslahti 1997a; 1997b) but here it is appropriate to talk about the virtual school. I argue that questions like "Is a virtual school something larger than a virtual classroom?" are not to the point because when we use terms that come from the conventional context we should not transfer them to the context of virtual environments automatically. Otherwise we will never be able to advance very far from the conventional school, rather we would still continue to treat them as electronic versions of the traditional school. On the other hand, virtual indeed refers to something that already exists or which we can imagine to exist in the actual world. The appropriateness of the use of the term 'virtual school' here, then, comes from my introduction concerning the school as a place. This is a connection I'll try to investigate further.

The virtual school has been defined as a school that lack a physical building but nevertheless functions as an information system (Paulsen 1987; Blystone 1989; Tella 1995a). My approach is a bit different, relating to Tella's (1995a) idea of a symbiosis of traditional school and virtual school:

> "If we regard virtual school as a symbiotic extension of ordinary school, part of the activities of physical school may be moved to virtual school and carried out there with the aid of information and communication technologies Even though virtual school may exist without a physical building, based exclusively on communications networks, e-mail, and computer conferences, at this stage it may be wise to consider the school of

> the future particularly as a symbiosis of virtual and physical school. " (Tella 1995a, 15).

This mixture of ordinary school and virtual school, is a most interesting one. Let us consider LIVE situations (which are described in greater detail by Riikka Ristola in this report). The class of pupils is scattered all around, keeping touch with each other with the use of MICT. The term 'nomadism' has sometimes been used in the context of electronic environments (cf. Attali 1990). The metaphor might be appropriate here as well. Nomadism deals with people who move from place to place in order to find green fields for their livestock. It is not aimless wandering as it is sometimes misinterpreted. That is similar to what LIVE pupils do. They travel outside the school in order to find and get specific information relating to the problems they try to solve. When they find appropriate information, it is processed and mediated in real time to other pupils, who may be in the school building or somewhere else. I would like to speculate on LIVE situations even more. Perhaps the question is not that the information is just mediated to school from the field. We can also think that the LIVE processes take place in a school which does not have any specific physical manifestation. In this way our approach is not 'school-centred' in the ordinary way. Our perspective is not to look at LIVE from the kind of viewpoint I started my article with when I regarded the school as a differentiated institution separated physically, temporally and functionally from its environment. Rather, I prefer to regard the LIVE project here as educational performance situated flexibly in relation to geographical and physical elements. 'School', then, is the interaction which takes place in real time between the participants (in the spirit of co-operative learning, as Sariola, Rönkä and Nummi elucidate in this publication), completed with pupils' and teacher's actions in various places simultaneously. Here we do not deal with 'going outside of a

school' and 'coming back to a school'; rather, people are in different places carrying out their things simultaneously. The border between school as a physical place and environment becomes blurred. The ordinary physical school is only a part of greater complex.

In my view Tella (1995a) focused somewhat differently when he talked about the symbiosis of ordinary physical school and virtual school. If I read correctly between his lines in the quotation above, Tella regards the symbiosis of ordinary school and virtual school as an either-or situation, virtual and ordinary separated temporally but complementing each other. Tiffin and Rajasinham present similar ideas by arguing that there will be need both for virtual class (as they call it) and for traditional school. However, their functions differ.

> "The virtual class is a meeting place for virtual communities of learners with a shared interest in the same subject. The conventional classroom of the future will be a community classroom, a meeting place for people who live in the same locality and have interest in common because they are neighbours. ... It will be a place where people learn social and interpersonal skills, to express themselves in song and dance, to take part in sports and team activities, to learn arts and crafts, cooking and woodwork, gardening and pottery and skills of doing that involve touch and taste and smell." (Tiffin & Rajasingham 1995, 177)

Blystone's reflections on virtual school may be regarded as historical here—historical in the sense that they were published as early as 1989. His definition of virtual school comes from Paulsen, who has defined virtual school as an information system. This system does not exist as a physical building. Upon comparison, Blystone finds considerable distinction between traditional (this is the word he uses) school and virtual school. Traditional schools deal with buildings and with bodies that are transported to these

buildings, and fed there, and so on. Virtual schools, on the contrary, are free of these things. They are free also from limitations of time and distance.

According to Blystone virtual school is something else than conventional school. When we come to a more recent conception, virtual school and conventional school complement each other, as was the case in Tiffin and Rajasingham (1995). Tella also speaks in these terms (Tella 1995a, 15) but in his text I find the idea of parallelism. The functional distinction between virtual school and ordinary physical (Tella's version of Blystone's 'traditional' and Tiffin and Rajasingham's 'conventional') school is not as great as it is in the case of Tiffin and Rajasingham. I call for an approach where the symbiosis is even more complete. Perhaps my thoughts are not as provocative and radical as I think they are, but I assume that my perspective, with its cyborgs and other, less strange things, might add something new to the discussion.

BUILDINGS, BODIES, AND TECHNOLOGY

First, I would like to adapt some notions which come from anthropology, including deterritorialisation, for use in this discussion. Deterritorialisation refers to the transcending of geographical boundaries. Arjun Appadurai (1990; 1991) finds the processes of deterritorialisation taking place as a universal development in the present world, ranging from migration to global flows of media. I want to remind the reader that I began my article with the argument that school is no longer a place, as it used to be. Deterritorialisation of education is obvious, for example, in the global flow of distance education, resulting in the creation of a certain kind of eduscape (cf. 'scapes' in Appadurai 1990). An aspect of deterritorialisation is also to be found in the development

of virtual school. School transcends spatial matters, it more or less leaves a particular territory.

Another way to approach these developments concerns translocalism. The relationship between school and the surrounding reality changes in such projects as LIVE. The LIVE situation is a combination of the local actions of pupil groups or individuals in different sites and the mediated interaction between them. Accordingly, educational activities take place translocally. This kind of translocalism has been discussed by Dahlén, Hannerz and Lindquist (1996). They speak of translocalities, translocal relationships, translocal fields, and so on. Their main interests deal with problems of ethnography in a translocal context and in the question of field, as it is understood in anthropology. According to Dahlén et al., translocal fields do not base on geographical determinants but on common interests and on interaction between the participants. They are combinations of people in diverse localities and interaction between them and, I claim, the mediating technology. Hence, we return to the idea of symbiosis.

In this connection, it may be seen that the walls of school become more and more permeable. The perspective I take here might be surprising, for it is that of cyborgs. The word 'cyborg' comes from 'cybernetic organism': 'a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction' (Haraway 1991, 149). The most familiar examples of cyborgs are to be found in Hollywood movies, such as Robocop and Blade Runner. What does Robocop have to do with virtual school? Perhaps not much—so far. However, the nature of cyborgs as partly human and partly technological is not so far removed from the symbiosis between virtual school and ordinary school as one might expect. Late 20th-century machines, says Haraway, have made thoroughly ambiguous several boundaries

of dualistic differences such as natural and artificial, organism and machine, or public and private. 'We are living through a movement from organic, industrial society to a polymorphous, information system' where '[t]he home, workplace, market, public arena, the body itself—all can be dispersed and interfaced in nearly infinite, polymorphous ways' (Haraway 1991, 161, 163). Cyborgs have a futuristic character. They point to the coming needs of the future and to tomorrow's environments, and they are already everywhere detectible, for example in the mode of quasi-objects like databases, argues Haraway (1995). What about schools then, I wonder.

Lemke, who trumpets for education in cyberspace instead of in schools and in classrooms, places cyborgs in the context of education in the following way:

> "It is fashionable today to speak of 'cyborgs'. This metaphor ... reminds us that we are not just organisms, we are organisms constituted by our interactions with our environments, and increasingly those environments are artefactual. We are made by doing-with, and the things we do-with include computers, video, and all the other tools of our technologies. There are not simply humans on one side and machines on the other. Humans are shaped by their interactions with machines just as machines are shaped by their interactions with humans." (Lemke 1993).

These questions have been noticed in the research on virtual environments. Rosanne Stone asks: "Who am I studying? A group of people? Their machines? A group of people and or in their machines? Or something else?" (Stone 1990, 81). As a researcher I have faced similar questions. The heavy involvement of technology in everyday school life changes the way how we conceive of school. Where are the bodies (pupils, teachers), where is the building, where do the activities of school take place, and so on? Stone, who investi-

gates virtual cultures, continue: "I have to start thinking about watching the machines just as attentively as I watch the people, because, for them, the machines are not merely passage points" (Stone 1990, 82). Human and technology blend. This has been noticed also by some anthropologists who call for ethnography (which they call cyborg anthropology) to examine the boundaries between humans and machines as well as the differences that constitute these boundaries (Downey et al. 1995).

And this is the point, I believe, where Tella's idea about the symbiosis school takes one step further. Guided by the cyborg metaphor, school now appears partly physical partly virtual. In this way it is no longer very sensible to regard school on the one hand as a physical place and on the other hand as an electronic creation, but rather as a mix of physical and technical elements. The activities that take place in school, including teaching and learning, concern the two parts of school. Here we have varying aspects of traditional features and new, electronic features. When talking about virtual environments Rosanne Stone notes that: "concepts like distance, inside/outside, and even the physical body take on new and frequently disturbing meanings". (Stone 1990, 84). This view is in accordance with the nature of virtuality. Virtuality refers both to the actual world, which is familiar to us, and to possible worlds, which might be either recognisable or totally strange (Kynäslahti 1997b). The symbiosis of conventional school and virtual school, then, begins to appear not just as a symbiosis, but as some kind of *nouvelle creature*: a mix of bodies, buildings, etc., and technology.

Am I seriously suggesting that the extensive use of MICT transforms the school into cyborg? This sounds like a crazy idea but I am afraid that is rather near what I am trying to say here. I definitely do not want to introduce a new con-

cept of cyborg school into the overflowing pool of MICT terminology. Instead, I claim that we can benefit from the idea of cyborgs when we look at (if we use Arnold's [1996] expression) the high-tech school, a metaphor that Lemke (1993) suggested.

CONCLUSION

I started by claiming that there is a certain spatial and temporal discontinuity between school and the surrounding reality. I also said that school has the character of functional differentiation in our society. As a reflection of larger social developments school keeps changing, mirroring the advancement of information society, and MICT play an essential role in this interplay.

I used LIVE as an example to speculate how physical, spatial and temporal aspects are blended in the process of creating the virtual school. The school is simultaneously in many places, which causes its form of existence to become a mix of buildings, bodies, technology and mediated interaction in an electronic sphere. In addition, the presence of human participants is becoming increasingly 'electronic' and virtual. This kind of school, with its diminished significance of place and its flow of educational activities between different places, also parallels the processes of deterritorialisation and translocalism which occur in the present world. The relationship between school and surrounding reality is immediate in LIVE. School becomes a part of the environment and vice versa. As Reid puts it, school is an invention of its time. School is school in every epoch, whatever its character or form of existence. The school of the information society is more or less like a cyborg. At any rate, it is school.

An Overview of Modern Information and Communication Technologies (MICT) in Teacher Education at the Helsinki University Department of Teacher Education

Aarno Rönkä

The purpose of this article is to describe how the research of modern information and communication technologies (MICT) in education and its applications to teaching have developed at the Helsinki University Department of Teacher Education (HUDTE) especially in the 1990s. It is shown here that there have been certain trends leading to the present conceptions of open and distance learning (ODL) and virtual pedagogy. In the early 1990s, research and teaching experiments pertaining to computer-mediated communication (CMC) introduced information networks to many levels of education, from foreign language teaching to other fields of teacher education. The study of open and flexible learning environments supported by MICT has received a lot of attention at the HUDTE, leading to the present efforts to develop virtual pedagogy. One focus has been on the open marketplace model, another on improving virtual school working methods in the research and development project UTOPIA (1992–1994), which led to several applications of a virtual school environment and many recommendations relating to the introduction of technological innovations in education. Yet another line of development is based on the research and experiences of distance education, both in teacher education and in school applications.

The Kilpisjärvi project (1994–1997) represented a long-term case study of classroom-focused distance education using videoconferencing. These trends have led to the research and development work which has been continued and co-ordinated by The Media Education Centre, founded in 1996. Its work is focused on the educational applications of MICT, ODL techniques, and virtual pedagogy, and it is the main organiser of the LIVE project.

Keywords: Modern information and communication technologies; open and distance learning; virtual pedagogy.

EARLIER TRENDS OF MICT IN TEACHER EDUCATION

Modern information and communication technologies (MICT) in education have long been an important field of research and a specific focus of teaching at the Helsinki University Department of Teacher Education (Tella 1996, 51–57). In the 1970s, the HUDTE started with computer courses on the use of statistics, tool software and programming. In the 1980s, the use of information technology as a tool was integrated into various teacher education courses.

In the early 1990s, several MICT-based experiments took place at the level of university studies. The growing importance of MICT in the Finnish teacher education of the 1990s can be seen in the introduction of various new teaching and training practices and in many didactic and pedagogic research and development projects relating to educational applications of MICT at practically all levels of education (for detailed analyses, see Meisalo & Lavonen 1995; Tella 1995a, 23–32).

Some of those trends will be described below, to the extent they are relevant to the main topic of this publication, viz. how the educational applications of MICT have developed in the directions of virtual pedagogy and open and distance learning (ODL).

RESEARCH AND DEVELOPMENT OF COMPUTER-MEDIATED COMMUNICATION

In the HUDTE, one branch of research on MICT was focused on the use of e-mail and communication networks in schools, e.g. how computer-mediated communication (CMC), carried out via communications networks and electronic mail, could be adapted to education. Research was first targeted on foreign language teaching in Finnish senior secondary schools, including thematic and linguistic analyses of electronic mail communication and studies of student attitudes or preferences for teaching practices or tools as well as the gender sensitivity of e-mail (Tella 1991; 1992a; 1992b). It was shown that the introduction of communications networks as a technological innovation into foreign language classrooms was successful, serving as a model for future action. Methods of classroom work slightly changed, taking the authenticity of e-mail into account and increasing learners' autonomous and group work. Computer-mediated communication and e-mail proved to be a useful activity which can replace part of traditional teaching and become a relevant part of the teaching/learning process. E-mail communication encouraged writing and exchanging ideas in open-ended linguistic situations in an information-rich learning environment.

Research and experiments on computer-mediated communication in the HUDTE and the teacher training schools led to new, gradually widening teaching practices, which included the use of information networks in classrooms (e.g. e-mail, computer conferencing, newsgroups, gophers, first experiences with the WWW) and increased the share of MICT in teacher training. The IMTEC (International Movement Towards Educational Change) Project 1992–1994, led by the Finnish National Board of Education and carried out by several schools around Finland, studied the possibilities of using communication networks in general education and the development of telematic teaching and learning practices in national and international contexts (Huovinen & Mattila 1995; Rönkä 1995b). A lot of telematic activities were developed in the project schools, which were linked by e-mail and electronic conferencing (the training school experiences in Rönkä 1995a).

As the experimenting teachers found it problematic to introduce technological innovations and new practices into schools, they came to the conclusion that it was necessary, among other things, to establish teachers' professional development groups in schools and to provide teachers and students with technologically better school networks that would be linked to communication networks by fixed data lines through local area networks or by other faster connections instead of only a few modems through ordinary telephone lines.

TOWARDS VIRTUAL SCHOOL PEDAGOGY

The study of open and flexible learning environments supported by MICT has received a lot of interest in the HUDTE. One of the interests has been the 'open marketplace' model,

in which learners have a lot of freedom of choice in how they learn in an information-rich environment supported by MICT and in which the teacher has a more supportive and guiding role than before (e.g. Meisalo & Lavonen 1995, 59–60). Another line of development and research has focused on virtual school pedagogy (introduced by Tella 1992c). In their joint research and development project UTOPIA (1992–1994), the National Board of Education, the Finnish IT Centre for Schools, together with the HUDTE concentrated on improving various virtual school working methods and teaching practices to meet the needs of both comprehensive and senior secondary schools (for detailed analysis, see Tella 1994a; Tella 1994b). Some of the basic ideas and conclusions of the project can be mentioned here (see also Tella 1995a, 28–32; Anon. 1997, 23). For example, a considerable part of the studying process can be transferred to the students' homes: one or more school classes are transformed into 'virtual classes', some of the tasks and assignments given at school are planned to be completed in the homes as the students send their answers to a common computer conference or to the teacher's mailbox or they make use of fax machines and mobile phones when sending their answers. At school students are usually given preliminary preparation for virtual homework, which allows them to engage in collaborative work in pairs or in small groups. Students' tasks simulate real life learning situations as closely as possible according to constructivist concepts of learning.

The findings of the UTOPIA project show that

1. by participating in computer conferences teachers and students not only acquire good skills in using the tools of telematics but also gain experience and access information to be used in various discussions;

2. the handling of larger topics underlines the multi-faceted nature of communication and work methods (with special emphasis on the co-operative, self-tutoring, problem-oriented and autonomous methods of working);
3. the information provided through the Internet or some other information service system is directly applicable to studying, teaching and supporting the individual intellectual growth of both the teachers and the students;
4. in a telematic learning environment the teacher has to consider more carefully than before what kind of communication serves the teaching-learning process best both from the teacher's own standpoint and that of a student or a student group;
5. virtual school is an effective tool in the integration of various school subjects and levels of education; the resulting advantages being a higher tolerance of ambiguous information, the ability to interact on several levels and directions, and to comprehend change and growth;
6. virtual school is a perfect place for putting into action many of the work methods introduced by the constructivist concept of learning.

One of the technological conclusions of the UTOPIA project was that the communications network of schools should be connected with as many computers from each school as possible. In order to improve the operation of schools, they should connect to those networks via different local networks and by using fixed data lines. Thus the control and restriction of communications would become unnecessary. This in turn would enable schools to fully concentrate on improving the quality of communications. This recommendation, which was supported by the conclusions of the IMTEC Project, has been generally accepted and followed in

the late 1990s, as the national strategy of education, training and research in information society by the Finnish Ministry of Education (1995) is being implemented in the networking of Finnish schools.

Research on the virtual school has focused on i) factors that have facilitated the transformation of industrial societies to information and network societies, ii) the possibilities of the virtual school as a future-oriented school form, iii) the tools of the new information and communication technology, and iv) global networking as a framework for the learning environment (Tella 1995a).

One of the findings leading to new research and development has been the fact that the virtual school can operate as part of the existing school system and so facilitate the introduction of new information and communications technologies in schools (Tella 1995a, 15).

FROM DISTANCE EDUCATION TOWARDS OPEN AND DISTANCE LEARNING

Another research and development field in the HUDTE has been distance education, which has strong traditions in Finnish adult education (for a detailed description of earlier developments, see Husu et al. 1994). The first experiences of distance education in Helsinki were obtained in special courses of primary school teacher education. As the results were mostly positive, the experiments were continued at the primary school and secondary school levels and gradually incorporated into teacher training. The first classroom-focused distance teaching experiment was made in the special programme for primary school teacher education in the

autumn of 1993. Teacher students received training in audiographic distance teaching from Helsinki to Ruskela Primary School in Tuusula, 30 kilometres north of Helsinki.

The next step was research on and development of classroom-focused distance education in schools and in teacher training. It included the Kilpisjärvi Project 1994–97, an action research project at the secondary school level: Kilpisjärvi School, a small rural school in northern Lapland, about 1,200 km away from Helsinki, was supported by distance teaching in several subjects from Helsinki Second Teacher Training School through an ISDN-based videoconferencing link (See Husu et al. 1994; Meisalo 1996; Salminen 1997). The development work also included practical training in distance teaching, which was carried out in various teacher training programmes of the HUDTE. The results of this research and development work show that it is possible to teach and learn successfully at a distance with the help of videoconferencing and other MICT applications (in three years about 15 per cent of the studies of the Kilpisjärvi experiment group took place through videoconferencing, and in some subjects the share was even about 60 per cent) and that open and distance learning offers new possibilities for organising school education.

Other research results show, for example, that videoconferencing makes it possible to maintain versatile interaction in the teaching/learning process, which stresses the students' co-operative and self-directive study skills although the teacher's planning, mediating and supportive role is of great significance; that situation-based media choice and planning, taking into account the audio, video and computer conferencing components, is an important factor in videoconferencing; and that the virtual school greatly affects also participants in the communities outside school (for a detailed analysis, see Meisalo 1996; also Tella &

Kynäslahti 1997). The good experiences of the development projects have led to the increase of distance education training in both pre-service and in-service teacher education programmes.

THE MEDIA EDUCATION CENTRE AS THE COORDINATOR

The research and development work of the HUDTE in the field of MICT in education has lately been continued and coordinated by the Media Education Centre, which was founded in September 1996. Its work is focused on the educational applications of MICT, ODL techniques, and virtual pedagogy. The Centre is also the main coordinator of the school network which now consists of the HUDTE, Helsinki Second Teacher Training School, Ruskela Primary School and Kilpisjärvi School. This school network, interlinked via MICT in a number of different ways, is also used in the LIVE project (1997–2000), organised by the Media Education Centre. In this project, research will be conducted on the networking models of teaching and learning in an open flexi-mode virtual school environment, supported by MICT and especially by the use of mobile telecommunications. The LIVE project is naturally only one initiative in applying MICT to general education and teacher education, as there are many other challenges and goals for future research and development in this field.

Findings from the Pilot Stage of the LIVE Project

Riikka Ristola & Aarno Rönkä

This article describes how the pilot stage of the LIVE project was carried out during the spring of 1997. During the pilot stage, some basic ideas of LIVE were tested at two levels of implementation, Levels I and II. Early findings of the pilot stage indicated the important role of didactic media planning during the development of the LIVE working model. The pilot stage also emphasised how pupils' communication, social, co-operative and MICT skills are essential for learning in an open and distance learning environment.

Keywords: LIVE, learning environment, didactic media planning, metacognitive skills, role of teacher.

INTRODUCTION

The developmental basis for the LIVE project emerged from common criticism directed against current classroom education in schools. Schools have been criticised for not reacting to innovations quickly enough and for failing to reform their systems. Changes, such as the pedagogical use of modern information and communication technologies, give new possibilities to extend the concept of the learning environment. The technologies used so far have been too dependent on time and place, as earlier experiences of videoconferencing have shown. Instead, there should be more mobility and flexibility in the learning situation. New, port-

able, integrated mobile phones made this kind of change possible in the LIVE project. Still, the background of the LIVE project is rooted in teacher education and educational sciences. Hence, the important role of teacher is emphasised in creating such a telematic, open learning environment.

Nummi, Rönkä and Sariola began planning the LIVE project in spring 1996, by outlining the theoretical background, the didactic working models and the MICT environment for the pilot stage (Nummi, Rönkä & Sariola 1997, 126–130).

The pilot stage of the LIVE project started in spring 1997. The purpose was to test didactic networking models. By testing and analysing LIVE in practice Level I and Level II of implementation were defined more closely (cf. Nummi, Rönkä & Sariola 1998). Technical applications were also tested in order to answer some research problems. Audioconferencing, videoconferencing, e-mail and fax were used in the pilot testing.

The pilot stage contained three sections. The first two parts were carried out at the primary school level in the University Teacher Training School, Ruskela Primary School and Kilpisjärvi School. The rehearsal of the pilot stage was planned and carried out by media education students Marjo Kyllönen, Anu Passi, Riikka Ristola, Sanna Vahtivuori and Petra Wager. This rehearsal was a part of a course in Media education 15 credit and Practicum studies.

The third part of the pilot stage took place in the Upper Secondary School of the University Teacher Training School, in which the lecturers tested a telematic working model in a camp school environment.

PEDAGOGICAL APPLICATIONS

The working methods and practices employed during the project are called LIVE working models (cf. Nummi, Rönkä & Sariola 1998). These working models consist of three levels, which are partly cumulative. Two of them were tested during the pilot stage.

LIVE Level I

The level I working model began with planning the content and setting goals together. A strong emphasis was put on social aspects and the co-operative learning process. After that the learners were divided into a LIVE group and a local group at school. The pupils could opt either for the LIVE group or for the local group. The local group looked for background information from available sources at school, for instance from the Internet. Meanwhile the LIVE group collected real-time information outside school (Figure 1). The groups communicated via audioconferencing, fax and e-mail. The learning process was evaluated together with both groups after every LIVE session. The teachers recorded their experiences in their portfolio. (Nummi, Rönkä & Sariola 1997, 129) (cf. Nummi, Rönkä & Sariola 1998, Figure: Level I)

LIVE Level II

The second level of the LIVE working model expanded the learning environment into a more networked model. A distance learning situation was created between two schools and the LIVE groups. The work started with joint planning

during a videoconference. The learners were divided into groups called teleteams, as at level I. However, the teleteams consisted of members from both schools. Next, the groups began to collect and process real-time information. Both LIVE groups communicated via audioconferencing and fax with the local groups. Also e-mail messages were used in collecting data. (cf. Nummi, Rönkä & Sariola 1998, Figure: Level II)

The role of each LIVE group was to act as a telematic expert group in their own learner networks. The role of the local group was to collect further information on the chosen topic from various available sources, like the Internet. They requested the LIVE group to answer questions and give explanations of the topic. Videoconference was used in evaluation and discussion during the session. (Nummi, Rönkä & Sariola 1997, 129)

SOME EXAMPLES OF THE LIVE PILOT STAGE

As mentioned before, the LIVE working models were tested at various levels. In the following, we will introduce some of the tested examples of the LIVE levels. The pilot phase consisted of several applications from both level I and level II. In practice, level I was carried out by pupils collecting data by interviewing people in the streets. The pupils decided to find out what media are by asking a number of people in the streets. As a result of this, the pupils realised that they had themselves more knowledge of telematic applications than they had thought. Conducting interviews was one of the primary learning goals, because it took place in the Finnish-language lessons (Figure 1).

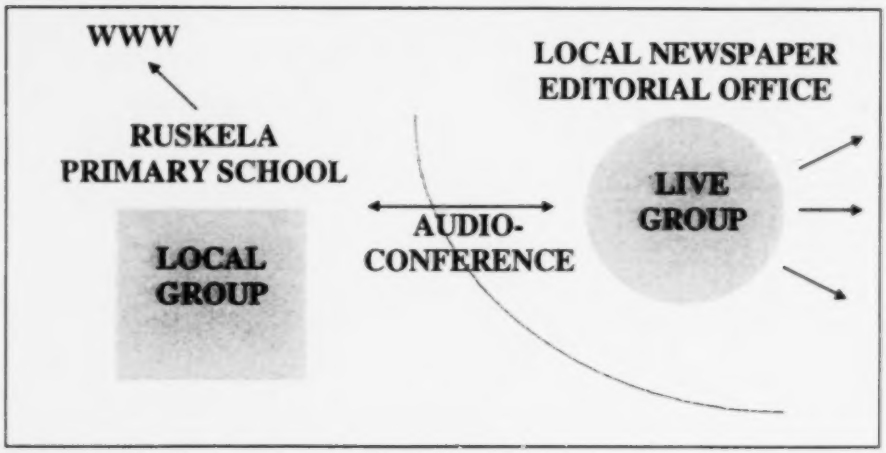

FIGURE 1: LIVE LEVEL I IN PRACTICE.

After obtaining several answers to their research question the LIVE group visited the local newspaper editorial office. Their aim was to obtain expert information. In some cases the questions were inaccurate and the local group at school had to ask the editors clarifying questions. The role of the local group at school was especially active. In this way the LIVE working model as a symbiosis of virtual and physical school promotes the integration of schools and the surrounding society. Experts from various fields can take part telematically in the activities of the school, which creates a competent discussion and innovation forum to satisfy the needs of the pupils, teachers and the whole learning process (Tella 1995a, 18).

The third example of level I can be taken from geography. The aim was to learn to know the characteristics of the surrounding nature. The LIVE group walked around near school and described their route via audio. In school, the local group drew a map while listening to the description given by the LIVE group. The pupils concentrated on describing their location spatially and clearly in order to determine the nature of their local environment. As Lehtinen

(1997) has observed, learning in virtual environments and the aspect of openness are approaching each other. This virtuality and openness helps learning become socially and culturally situated (Lehtinen 1997, 17).

Level II in Practice

As a more networked model, Level II lent itself to a comparison of subject contents. An extension from a local learning environment with the help of MICT to a more global environment provided new experiences. According to Tella (1995a) a learning environment employing telematics is characterised by expanding means of influence and communication, shared resources and possibilities of exchanging ideas and negotiation, etc. (Tella 1995a, 7).

Testing of level II mainly involved a comparison of local sources of livelihoods and local histories between Kilpisjärvi School (located in northwestern Lapland, 1,200 km north of Helsinki) and Ruskela Primary School in southern Finland. While focusing on history, the pupils planned interview questions for the LIVE session. This took place through virtual co-operation. Audio- and videoconferencing were mostly used during teleteam-planning.

In the LIVE session, the LIVE group met the oldest inhabitant of Kilpisjärvi village, while the Ruskela LIVE group visited the local museum of history. In this kind of context real-time information was available from authentic primary sources. Pupils had a chance to visit virtually places they could not otherwise. One of the pupils from Kilpisjärvi, 1,200 km away, wrote in a self-evaluation report that "the most interesting and enjoyable thing today was when I *visited* (emphasis added) the museum of Ruskela".

The differences between livelihoods were examined by becoming acquainted with a cattle farm and a reindeer farm. The LIVE groups communicated with each another via audioconferencing and fax in real life situations, while the local groups were looking for background information through videoconferencing (Figure 2).

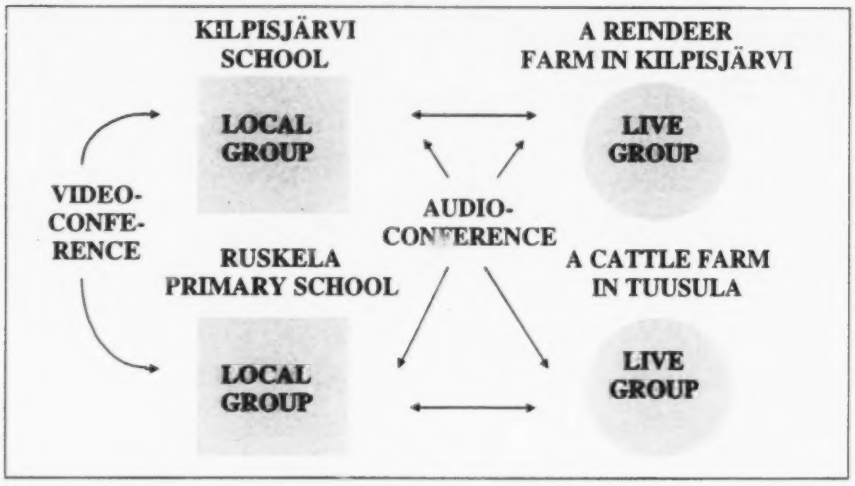

FIGURE 2: LIVE LEVEL II IN PRACTICE.

SOME FINDINGS OF THE PILOT STAGE

The data from the examples mentioned above was gathered by pupils mostly through interviews. Self-evaluation was used after every LIVE testing day. The pupils wrote a few sentences about what they had learned and what had been difficult, how their group had managed, what kind of technical problems they had found etc. Student-teachers made portfolios as a part of their studies and wrote down notes and didactic observations. The teachers of the University

Teacher Training School were interviewed about their experiences.

Based on the pilot phase experiences it seemed obvious that planning should be emphasised. Especially the didactic media planning facilitated open and flexible learning.

> "In rapidly changing learning situations, accurate didactic media planning makes decision making easier. In using telematic applications extra plans should be made to ensure mediated didactic content. An exact project schedule and understanding possibilities in telematic applications allow flexibility in the learning situation."
> (Translated by the author from the Finnish-language statement of one student teacher)

This kind of learning environment tends to emphasise the importance of co-operative planning. The big physical distance between learners and teachers at Level II creates a networked learning situation which requires careful planning at every level. In an information-rich, telematic learning environment the teacher has to consider carefully what kind of communication serves the teaching-learning process best, both from the teacher´s own and from the pupil´s or the group´s standpoint (Tella 1995a, 32).

During the pilot phase the didactic media planning emphasised the appropriate use of modern information and communication technologies as tools to deepen the quality of contents. It seemed essential to plan carefully which communication channel would support the goals of the learning process best (cf. e.g. Passi, Ristola & Vahtivuori 1997; Sariola 1997). In the LIVE project there are several channels to mediate interaction: audioconferencing, videoconferencing, fax, the Internet and e-mail. (cf. Sariola 1998)

Based on the pilot stage, the pupils' communication, social, co-operative and MICT skills were especially essential. A great amount of information can be conveyed quickly in a networked learning environment. The pupils are expected to have personal strategies to handle the wealth of information, to identify relevant information and to locate helpful sources. The pupils can be very different in their metacognitive skills; some pupils are more text-oriented than audio-visual learners. As Kaartinen points out, pupils need to have developed metacognitive skills to be able to set targets, choose strategies and self-evaluate their learning (cf. Kaartinen 1996).

However, the use of the integrated mobile phones in the LIVE project emphasises interaction through audio. Therefore, according to the pilot experiences, the role of the local group is important for the success of the activity. Writing down notes while listening, for instance, should be practised before facing real situations. Otherwise the local group cannot interact efficiently enough. The use of videoconferencing supports such learning situations as discussions at the beginning and the end of the day.

The pupils' co-operative and social skills developed during the pilot stage. They created their own codes of responding and answering. In other words, the interaction was mediated from pupils to pupils while the role of the teacher was more or less supportive. The pupils concentrated intensively that the teacher was ignored, and not until the evaluation session was it necessary for the teacher to play an active role. From this viewpoint it could be argued that the role of the virtual school teacher will be emphasised in the introductory and in the evaluation session. During the process the teacher´s role will tend to be rather one of providing support.

The pupils' metacognitive skills developed through the formulation and asking of questions, using descriptive language and expressing themselves accurately. Modern information handling and communication skills are needed when learning takes place in an open and flexible learning environment.

> "I started to plan the learning environment with the pupils' openness and activity on my mind. Based on the reports and discussions, I saw the pupils' MICT education as a key concept. ... It was amazing how the roles of pupils changed. The control of the learning situation moved strongly towards pupils when responsibility and tools (= skills, knowledge and technologies) were given to them."
> (Translated by the author from the Finnish-language statement of a student teacher)

The use of communications technology seemed very natural to pupils. During the pilot stage they learned to send faxes, e-mails and short messages. However, the most common way of using the technology was audioconferencing, which stressed the importance of co-operational and communicational skills.

SCHOOL TRIPS IN SECONDARY SCHOOL

In the spring of 1997 two LIVE experiments were conducted in connection with school trips at the secondary school level of the Second Teacher Training School of the University of Helsinki. It is customary for 9th graders in Finnish lower secondary schools to make one-week school trips to certain educationally valuable destinations. Although pupils enjoy these trips, they are not just for fun but also for learning. Their carefully planned programme may include visits to other schools, museums and other cultural places; pupils

are often expected to study background information about topics related to the trip; they also write and present reports about the trip.

Aims

The main purpose of the LIVE experiments was to see what effects the use of modern telecommunications for fast and versatile communication would have on the pupils' experiential learning in connection with the school trips. The experiments were also aimed to find out possibilities to organise pupils' work as co-operative learning experiences. Technically, it was interesting to see how secondary school pupils and their teachers could use the mobile equipment with the help of the integrated user interface of the Nokia Communicator.

Description of Experiments

In the first experiment in April 1997, a class of 9th-grade pupils made a trip to Stockholm, Sweden, which included a few days' stay in a Swedish partner school, Kämpinge skolan, and visits to places of interest in and around Stockholm. They had agreed to communicate with an 8th-grade class in Helsinki by using the mobile Communicator for phone calls or audioconferencing and also for fax or e-mail messages. The experiment consisted of three phases: 1) a co-operative planning phase together with teachers and pupils and the selection of 4-member LIVE group, which was responsible for the use of the Communicator during the trip and received basic training in the use of the mobile equipment; 2) the LIVE action phase with tasks and communica-

tion during the week; and 3) the evaluation phase, including discussions and reports by both teachers and pupils.

The LIVE action included sending faxes or e-mail and making phone calls between the LIVE group and the 8th graders. In their Swedish lessons, the 8th graders at school in Helsinki had prepared tasks and questions for the 9th graders on topics related to the trip to Sweden. Almost daily, the 9th graders reported about their trip to school by fax or e-mail. The pupils occasionally used the mobile phone for home calls. With the Communicator, the teachers in Stockholm could also call the home school or check their personal e-mail during the week. At the end of the week, there was a half-hour real-time audioconference in Swedish between the pupils in Helsinki and in Stockholm with the purpose of sharing experiences and information collected during the week. The whole class of 18 pupils in Helsinki participated in the audioconference by using a SoundStation conference phone.

The second experiment was a class trip to Sonnenberg Course Centre in St. Andreasberg, Oberhartz, Germany, by another 9th-grade class in late May 1997. There was a planning and training meeting with the teachers and the LIVE group of pupils before the trip. Because no counterpart class could be arranged at school, it was agreed that the pupils in Germany would keep a trip diary by using the notebook of the Communicator and send daily reports by fax and by e-mail to school, where their reports would be put on the noticeboard for other teachers and pupils to read. There was only one real-time audioconference between those in Germany and one teacher and two pupils in Helsinki in the middle of the week. It was quite an interesting real-time experience, as the pupils in Germany were on a beautiful meadow in the Hartz area, and their excitement could easily be noticed.

Results and Conclusions

In the evaluation of the first trip, the pupils thought that communication via fax, e-mail or phone was quite interesting and fun and also technically easy. They also regarded the possibility for real-time audioconferencing as a very good experience, a kind of highlight of the week, but the audioconferencing capabilities of the Communicator functioned well only with small groups. With the whole class listening or participating, the sound quality was not very good. Especially outdoors in the city surroundings, only one pupil at a time could use the Communicator. On the second trip the pupils also found the use of the Communicator quite easy. Sending faxes based on notebook files was very easy and efficient, and the audioconference was a great experience. With both trips, there were slight disagreements between teachers and pupils as to how the Communicator should be used. On the trip to Sweden, pupils said that the teachers controlled the use too much, and on the trip to Germany the pupils used the Communicator for sending faxes so independently that it did not please the class teacher.

The teachers also mentioned the technical ease of using the Communicator. In their opinion, the use of mobile telecommunications, i.e. phone, fax, e-mail, or audioconferencing gave many opportunities for motivated experiential learning and for good understanding of the learning content in real-time or time-independent communication. The teachers also used the Communicator for phone calls and e-mail messages to take care of some practical details of the trips and to keep up with their other professional duties.

To sum up the experiences of both trips, the co-operative planning phase seemed to be important for the success of

the LIVE action. With good co-operative planning and working, pupils can be actively involved so that everybody can work according to the goals which have been agreed on together. Versatile communication by using the different possibilities of mobile telecommunications can take place in both real-time and time-independent interaction. To enhance experiential learning, the possibilities for live discussions, interviews or reports by using the Communicator can also be used more effectively than in the pilot experiments. It is also important to organise the activities so that both local and LIVE groups can be actively involved with them. And finally, the analysis of the results and the evaluation of the activity should take place at both individual and group levels, including self-assessment.

The LIVE Project: Learning in a Virtual School Environment

Tomi Nummi, Aarno Rönkä & Janne Sariola

This article describes and analyses a research and development project called LIVE (Learning in a Virtual School Environment) whose general aim is to develop new didactic models for virtual school environments with a special view to mobile communication. A specific aim is to investigate the possibilities of increasing openness and flexibility in learning situations from the viewpoints of both the learner and the teacher. This is carried out by increasing the possibilities for co-operative and experiential learning in teacher education and by effectively using modern information and communication technologies (MICT) in open and flexible learning environments. The theoretical framework is based on five concepts, viz. the constructivist concept of learning, co-operative and experiential learning, open and flexible learning environment and virtual school.

The project is being carried out in a school network coordinated by the Media Education Centre of the Department of Teacher Education at the University of Helsinki. The mobile communication technology which is used in the in the ISDN- and GSM-based school network provides new opportunities for real-time interaction between school and the surrounding reality in learning situations. The LIVE project is part of the teacher education programmes at both pre-service and in-service levels and especially in distance education practice. In the project student teachers and teacher trainers work in co-operative projects with pupils. This will possibly lead to a functioning distance education network which

makes it possible to create a common virtual community of teacher education.

Keywords: Constructivist learning concept; co-operative learning; experiential learning; modern information and communication technologies; open and flexible learning environment; teacher education; virtual school.

INTRODUCTION

This article describes and analyses a research and development project called LIVE (Learning in a Virtual School Environment), whose aim is to develop new didactic models for virtual school environments. The project is being carried out at the Media Education Centre of the Department of Teacher Education at the University of Helsinki. Its didactic views are based on the concepts of constructivist and co-operative learning in flexible learning environments. The didactic models of the project stress the importance of the skills which are needed in group work, communication and information management and which are essential in the learning environment created or supported by modern information and communication technologies (MICT).

The developmental task of the LIVE project comes from the fact that although schools have traditionally been criticised for their slow adjustment to the changing needs of society, it seems that this has changed and that modern schools are more up-to-date and ready to keep up with the changing times than traditional schools used to be. This project is geared towards the kind of school development in which schools take an active role in the integration of MICT in their curricula. At the moment there is a great push towards change by the national strategy of education, training and research in the information society, which was introduced

by the Finnish Ministry of Education in 1995 and is being carried out in schools.

> "Schools and educational establishments are not islands: they need to be an integral part of the daily life of their environment, their municipality and the local business community. Increasingly, schools also have international contacts. Good telecommunication links facilitate networking with the local environment and provide for versatile contact with the outside world." (Ministry of Education 1995, 61–62)

The whole education system will be brought within the reach of information network services, ensuring that educational establishments can use these services. Being considered current and significant, open and distance learning is promoted at all levels of education and training (Ministry of Education 1995, 36). At present many Finnish schools are planning their own MICT strategies based on the national strategy designed by the Ministry of Education.

Teachers are seen to have a crucial role in the educational change, which is the reason to carry out the LIVE project in both pre-service and in-service teacher education.

> "The conditions and content of both the initial and continuing education of teachers must be developed to correspond to the demands of the information society. Teachers need to be trained to use the equipment required for open and flexible learning, to be able to tailor existing teaching material to suit their purposes and also to be able to develop their own material. Teachers must be able to manage the information relating to their own field as well as being able to handle the media used for communicating that information." (Ministry of Education 1995, 38)

Accordingly, the LIVE project is part of the teacher education programmes at both pre-service and in-service levels and especially in distance education practice. Student

teachers are familiarised with the working models and methods of virtual school during their training.

The mobile communication technology which is used in the LIVE project provides new opportunities for real-time interaction between school and surrounding reality in learning situations. The project is carried out in the ISDN- and GSM-based school network which consists of the Department of Teacher Education, the Second Teacher Training School, Ruskela Primary School and Kilpisjärvi School. Schools are linked by modern telecommunications, e.g. telephone, fax, videoconferencing and Internet connections.

The initial planning stage started in March 1996 with the study of the theoretical background and the design of both the didactic working models and the MICT environment for the pilot stage. The pilot study was carried out in the spring of 1997 by testing the first virtual school working models (cf. Ristola & Rönkä in this publication) with the purpose of analysing and resetting the research aims and problems. Based on the experiences gathered during the pilot stage, the project was launched in a more extensive way in the autumn of 1997. This research stage will last three years from 1997 to 2000.

RESEARCH DESIGN

Research Aims

The general aim of the LIVE project is to develop teaching and learning practices in an information-rich and knowledge-intensive virtual school environment with a special view to mobile communication. This is carried out by in-

creasing the possibilities for co-operative and experiential learning in teacher education and by effectively using modern information and communication technologies in open and flexible learning environments. A specific aim of the project is to investigate the possibilities of increasing openness and flexibility in the learning situations from the viewpoints of both the learner and the teacher. This is motivated, among other things, by the development of teacher education in the direction of ODL (open and distance learning) (Tella 1997, 14–17; cf. Rönkä in this publication).

Accordingly, the LIVE project has been designed to meet some of the challenges of the information society as it develops Finnish teacher education practices in the direction of open and flexible learning environments. The national information strategy gives schools a mission to develop pupils' information management skills.

> "It is the task of general education to provide every girl and boy with the versatile basic skills in acquiring, managing and communicating information which are necessary in the information society and essential for successful further study." (Ministry of Education 1995, 38)

In addition to developing the skills mentioned in the national strategy, the LIVE project also deals with the metacognitive planning and assessment skills of pupils and teachers. Furthermore, it is anticipated that the networking models developed in the LIVE project will offer schools an alternative solution how to implement their strategies. A long-term goal is to develop a model for the whole school how to work co-operatively when supported by MICT.

Research Tasks

The main research task is focused on describing and developing the didactic networking models of the virtual school. In this task it is assumed that through teacher education it is possible to change teaching, and furthermore that such changes can have a direct or indirect effect on the learner's learning process. The theoretical background is based on changing the learning conceptions of both the teacher and the learner from behaviourist conceptions towards constructivist ones. With regard to the learning environment, this means the promotion of open and flexible learning situations. Thus one challenging task of teacher education is to create didactic working models in which various elements of the open learning environment can be implemented. In addition to openness and flexibility, the dimension of social learning is taken into account in the form of co-operative learning. Team-working models are applied to the MICT-based learning environment for the purpose of creating teaching models applicable to teacher education.

Research Problems

In the following, based on the general and specific aims of the project, a number of research areas and problems will be specified. They are related to the whole project, and therefore not all of them are studied during the first year of the project. However, it is necessary to give a sufficiently broad initial perspective to the various possibilities of the theoretical background. As in any developmental project, there will be changes, modifications and new focuses in the research problems as the project goes on. Consequently, one of the main purposes of presenting all these problem areas

here is to initiate a continuous dialogue between the different groups of people associated with the project, viz. teachers, researchers and students alike.

In each research area, the first-year research problems have been marked with a dark background.

A. The development of open and flexible learning environments in teacher education

- What are the characteristics of the open and flexible learning environment in teacher education that will enable the criteria of the virtual school to be fulfilled?
- How can the student teacher implement elements of openness and flexibility in training?
- What kind of communication and information management skills are needed in open and flexible learning environments?

How can the interaction between school and surrounding community in learning situations be increased and supported?

B. The development of virtual school working methods and models

The strategic aim is to create and develop virtual school working methods and models applicable to teacher education so that the student teacher is able to plan and use them in open and flexible learning environments. This will lead to the research and development of didactic networking models in which a co-operative school (Sharan & Sharan 1994, 97) can be expanded into a co-operative virtual school and also into a working model of organising teacher education.

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- Does the knowledge and use of virtual school working models improve the quality of learning?
- How can possible improvements of learning in virtual school environments be validated?
- Which criteria of virtual school working models in an open and flexible learning environment are supported by modern information and communication technologies?
- What kind of working models are needed in the open and flexible learning environment for pre-service and in-service teacher training?
- What are the characteristics of virtual school working models in teacher education?
- What are the characteristics of co-operative working in a virtual school?
- What are the benefits of co-operative learning in a virtual school?

C. Changing teachers' professional working and their learning conception

The project is especially focused on teacher education because its basic assumption is to change the learner's learning by changing the teacher's teaching. It also means changing the teacher's conception of learning from behaviouristic notions in favour of constructivist ones. In teacher education this means a critical re-evaluation of the working models in both pre-service and in-service teacher training and their development leading to the adoption of those used in open and flexible learning environments.

- How can the teacher be made to realise the basis of his/her teaching and change it?
- Does the change of the teacher's teaching change the learner's learning? If it does, how does it show in what the learner does?

- What kind of tutoring models can be developed for teacher education to help teacher students be conscious of their own teaching styles in a virtual school environment?

D. Developing the use of modern information and communication technologies in open and flexible learning environments

- What kind of learning situations are videoconferencing, integrated mobile communications equipment and other telematic tools best suited for?
- What are the benefits or the problems of the use of MICT in open and flexible learning environments?
- How does the use of MICT change communication in virtual school teaching and learning?
- How are the latest developments of MICT applicable to teacher education and how they should be developed?

THEORETICAL FRAMEWORK

The theoretical framework of the LIVE project is based on five concepts, viz. The constructivist concept of learning, co-operative and experiential learning, open and flexible learning environment and virtual school. (For detailed analysis of these concepts and other related theoretical points, see Tella, Vähäpassi and Kynäslahti in this publication.)

According to the constructivist concept, learning is an active process which takes place in an interaction between learners and the teacher. When constructing their own knowledge and skills, learners try to reflect on their own actions according to their goals and with regard to the surrounding

reality, especially to the groups they belong to. Through reflection in social interaction, learners expand the awareness of the foundations of their actions. In telematic networking this means e.g. common problem-solving in a computer conference or an interactive audio or video conference between two or more learner groups. Learners try to affect their way of learning and make choices about learning materials, subjects, goals or learning groups. Such a learner-centred model emphasises learners' responsibility and activity in the construction of their own knowledge and skills.

While putting an emphasis on the role of the learner, the constructivist concept of learning also changes the pedagogical decisions of the teacher. It leads to the emphasis of flexible teaching which pays attention to learners´ skills and abilities (Rauste-von Wright 1995, 121). The changing environment of action involves the teacher in a new kind of planning in which the essential factors of pedagogical decisions are the openness of the learning environment and situation-based media selection in the use of MICT (Sariola 1997, 72–81; cf. also Sariola in this publication). In practice, the teacher and the students together plan learning units in which both common and individual learning goals and contents are determined. Through planning it is especially determined at what pint of time learners or groups of learners interact between each other and when this interaction can be enhanced by mobile telecommunications.

Co-operative planning in MICT-supported environments makes it possible to expand the functions of the virtual network to be independent of time and space. With the help of MICT it is also possible to promote and strengthen the sense of community in the group. The groups may not necessarily even see each other, but they interact with each other via various forms of telecommunications. In this way

the teacher and the students build together a network of learning environments.

MICT gives opportunities for a new kind of networking, but it does not strengthen the sense of community among people. This can be done by adding co-operative working to networking. Co-operative learning (cf. Vähäpassi in this publication) differs from the conventional pedagogical approach, which emphasises cognitive goals and the teacher's position, by paying special attention to social aspects and common goals, i.e. the sense of community in learning.

> "Some co-operative learning methods call for more teacher direction than others, but all of them enable students to interact in varying degrees and talk about what they think, know, and feel about what they are learning. In addition, when students study together in small groups, they help each other and, at the same time, develop self-direction and responsibility for their learning." (Sharan, Y. & Sharan, S. 1994, 97)

However, when it comes to the pedagogical development of the whole school, it would be more meaningful if also the working models of teachers and the whole organisation were also oriented toward this kind of co-operation. Such an organisation is called a co-operative school (Johnson, D. & Johnson, R. 1994, 59–62). When this model is combined with MICT, it is possible to talk about a virtual co-operative school.

Virtual school can be seen as a situation where some of the school activities are carried out in a virtual reality environment. Learners work apart from the physical school environment and create for themselves a virtual space of learning which they can shape through their own actions. In virtual school immediate interaction between physically separate students and the teacher is achieved electronically (Keegan 1996, 8). The virtual school is the meeting place of

the virtual communities of learners who are interested in the same things (Tiffin & Rajasingham 1995, 177).

Virtual school can be seen as "an information system based on new information and communication technologies, which is able to deal with all the tasks of school" (Tella 1995a, 14). School becomes a transparent communication network in which learners build their own virtual environment according to their own study needs. The activities of ordinary school may also expand in the direction of virtual school and "be carried out there with the aid of information and communication technologies" (Tella 1995a, 15). Here we refer to the symbiotic interpretation of virtual school (see also Tella 1995b, 156–157).

The information and communication technologies used in virtual school create connections and promote interaction between school and society. Learners' studying expands from the classroom to the networks of flexible and open learning environments Flexibility means independence of time and space, while openness can be seen as learners' ability to make decisions in a learning situation. Learners can choose the learning materials, the topic, the learning group, or set their own learning goals.

In addition, the new learning environments are also characterised by learners' mobility. The use of telecommunications is not tied down to a certain physical place such as a school building, but the necessary tools go along with learners. In learning, mobility is important because it enables student groups to compare the information received from study materials and their earlier experiences with real situations outside school. Studying in the virtual school environment, which places the learning process in contact with the real world situations, puts the ideas of experiential learning into practice. According to Kolb (1984, 21),

> "... immediate personal experience is seen as the focal point for learning, giving life, texture, and subjective personal meaning to abstract concepts and at the same time providing a concrete, publicly shared reference point for testing the implications and validity of ideas during the learning process."

Experience also needs to be processed consciously by reflecting on it.

In Kolb´s (1984, 42) theoretical model experiential learning is seen as a cyclic process integrating concrete experience, reflection, abstract conceptualization and active experimentation (see Figure 1).

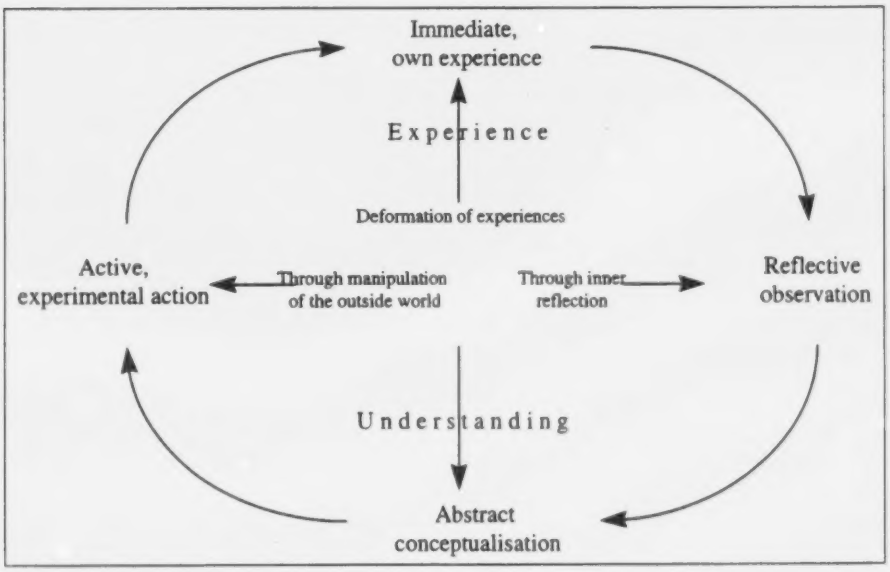

FIGURE 1. DIMENSIONS OF EXPERIENTIAL LEARNING AND FORMS OF KNOWLEDGE ON BASED ON KOLB (1984; CITED IN SAHLBERG & LEPPILAMPI 1994, 30).

Reflection plays an important role in that process because it means continuous active self-evaluation of one´s beliefs, thoughts and knowledge. Reflection can also be a co-operative action, focusing on the activity of a group (Sahlberg & Leppilampi 1994, 30)

Kohonen (1992, 17–18) finds several good points in experiential learning at school. By designing learning experiences that encourage learners to feel themselves competent and self-determined it is possible to enhance learners' intrinsic motivation and self-directed learning. Learners will find school motivating if it satisfies such needs as belonging, acceptance, satisfaction from work, self-actualization, power and self-control. With the use of co-operative learning groups that put an emphasis on the sense of belonging and commitment, it is possible to create need-fulfilling structures that lead to successful learning. According to Kohonen (1992, 18–21), experiential learning i) facilitates personal growth, ii) helps learners adapt to social change, iii) takes account of differences in learning ability, and iv) responds to learner needs and practical considerations.

The theoretical framework of the LIVE project is part of the field of media education and is therefore based on the principles of education. This framework constitutes the primary scientific background for the research and development work in Finnish teacher education.

PROGRESS OF THE RESEARCH PROJECT

Research Methods

LIVE is a three-year collaborative action research project which started with a pilot stage in the spring of 1997 and will finish in the spring of 2000. The researchers of the project are teacher educators who will act as development teams of open and distance learning networks in teacher education. The development teams consist of researchers and teacher educators at the Department of Teacher Education and in training schools. The researchers train teacher educators in planning and developing the didactic networking models to be introduced to teacher education.

The work of the development teams is co-operative by nature. When teams are established, teachers will work as working pairs that will then create teleteams of teachers and trainers. The physical network will be established at the earliest possible stage of the research project so that each member of the network will have enough time to be committed to co-operative working. The commitment to the process by the members who are mainly responsible for the action is essential, but the action research will expand to include all the other people who either participate in the social action or who are influenced by the action. In this way the development team will become a self-critical community [http://www.jyu.fi/hlheikki/~metodi.html] (20 January 1998).

The research team will use participant observation, and it aims to change the work of the teacher educators through development teams. Professional development calls for a critical analysis of their ways of working and their working

conditions by the participating teachers [http://www.jyu.fi/hlheikki/~metodi.html] (20 January 1998). Through the development of the teacher educators´ work, the researchers try to influence the learning of student teachers and pupils. The essential focus of the development work is the planning, implementation and evaluation of an open and flexible learning environment. During the project the research group will lean on the feedback received from all the persons involved. In the analysis, concepts are modelled and specified for reflection. The analysis will lead to the design of a new action model [http://www.uiah.fi/tm/~metodi/~020.htm] (20 January 1998).

Information for the research will be obtained by participant observation, by video recording learning situations, and by analysing both pupils´ audioconferences or e-mail messages and the contents of pupils´ self-assessment forms. In addition, the teachers, student teachers, and pupils will be interviewed. Information collection will also be supported by the process portfolios used in teacher education.

The Function of the Network

The LIVE project is carried out in a distance education network co-ordinated by the Media Education Centre. The network consists of the Media Education Centre, the Primary and Secondary Levels of the Helsinki Second Teacher Training School, Ruskela Primary School in Tuusula and Kilpisjärvi School in Enontekiö, Lapland.

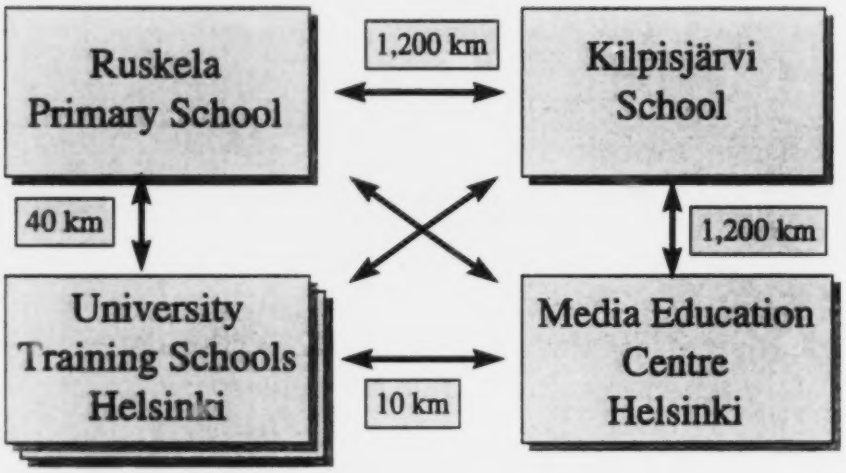

FIGURE 2. DISTANCE EDUCATION NETWORK BASED ON ISDN AND GSM TECHNOLOGIES.

The LIVE project expands the MICT-based learning environment and makes it possible to document events and processes outside school and communicate in real time by using mobile telecommunications, for example integrated mobile telephones, Communicators. Several teams of learners can be linked together in a synchronous telematic network. The interaction between teams can be improved by using several communication channels simultaneously. The Communicator enables the flexible, mobile use of audioconferencing, fax, and Internet services in communication. As a result, the distance education network becomes an open virtual learning environment, independent of time and space.

With the help of the latest applications of MICT, it is possible to create so-called LIVE teams at virtual school. These teams, equipped with integrated mobile communications equipment, can move around in real-time situations and transmit two-way messages. A similar idea, studying real-life situations and problems in distance learning, is being

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explored by the Impact North Carolina Project at the Appalachian State University where "students learn to plan, co-operate, present and deal with real-world processes, and problems that are models of the kind they will find outside the classroom" (Strom 1994, 13).

We call the new expansion of the learning environment "mobile learning environment", which is characterised by rapid interaction between school and the surrounding reality. It means that learners can more easily follow changing processes in the world on location, transmit information quickly from place to place, process the information in real-time communication, and store the data for later investigation. All of this can lead to better understanding of learning contents, which in this case also come from the world outside school. At the same time, through co-operative working, an individual learner can create his or her own learning space for developing his or her information management skills. Co-operative virtual school expands the experiences obtained from the research and development of classroom-focused distance education using videoconferencing (Husu et al. 1994; Meisalo 1996) in the direction of a more flexible learning environment.

Technological Environment

The technological environment of the LIVE project is based on the use of several simultaneous telecommunications systems. The schools in the distance education network have been connected to each other by three ISDN lines which enable the participants to communicate via videoconferencing or audiographics. For sending material, the instruction is supported by telefax and electronic mail. The latest application is a LIVE situation in which learners

moving outside school receive and manage information with the help of MICT. Learners are connected to each other in real-time interaction by mobile phones and lap-top computers or by integrated mobile Communicators (cf. Nummi in this publication).

Didactic Applications

The didactic applications of the LIVE project are investigated and developed in the pre-service and in-service media education training. The members of the research team guide students to create and try out didactic applications in research seminars and in distance teaching practice. Students in both primary school class teacher and primary and secondary school subject teacher education become familiar with the methods and the practices of media planning and co-operative learning during the distance education training period. At the beginning of each training period, students are divided into working pairs who then create their own telecommunications networks called teleteams. The members of a teleteam plan a teaching unit and evaluate their own work with the help of e-mail and other telecommunications tools. At the end of the course they collect a team portfolio. Part of the training is carried out via e-mail. The teacher trainer gives instruction in handling the equipment and supports the planning of open learning environments. Openness in this connection mainly means flexibility and selections in learning situations.

The working models of the project are called the LIVE models of work. They are divided into three levels according to the telematic levels used and the number of teams involved.

The First LIVE Level

At the beginning of their work, pupils check their prior knowledge of the chosen topic and brainstorm ideas about it together with the teacher or the student teacher. After brainstorming they choose the contents and set the common goals. Then they model the network involved with the open learning environment by building a physical network and by establishing teams, which is the basis for building the network in the virtual environment. The co-operative teams set their own goals and determine the responsibilities of each team member. The teams are established at the earliest possible stage so that the team members have enough time to commit themselves to the goals and work of their teams. Co-operative planning and common goals help to strengthen team cohesion and support the functioning of the team in the later stages of working.

Co-operative teams are then divided into a local team, which remains at school, and a LIVE team. The local team searches for background information from the Internet and other sources, while the LIVE team collects real-time information outside school. The teams communicate via audio-conferencing or e-mail. The evaluation of the work makes use of portfolio assessment so that the learners write down their learning experiences in individual working folders which are the basis for the collection of team portfolios. In the end, pupils present their work and achievements, and they also identify the areas where they need further development (see Figure 3).

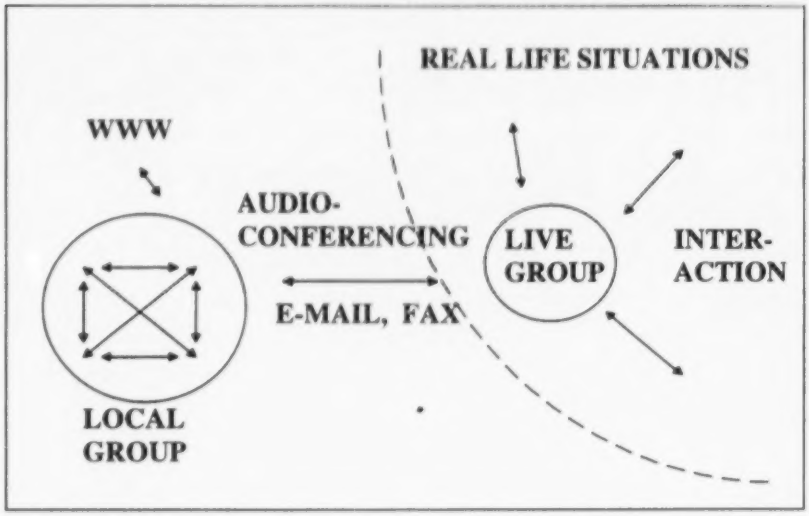

FIGURE 3. LIVE LEVEL I.

The first level work may deal with e.g. topics related to news or current events. Learners can interview people, possibly experts, in many kinds of surroundings: streets, shops, offices, factories and other workplaces, or cultural and other events.

The Second LIVE Level

The work is based on making use of the expertise of two different schools. The distance learning situation begins with joint planning via videoconferencing. The learners in each school are divided into teams, as was done at Level I, and start to collect and process information. The teams create a four-point telematic network in which communication takes place via audioconferencing or e-mail. Both LIVE teams communicate via audioconferencing and transmit the information in the form of e-mail messages to all the members of the network.

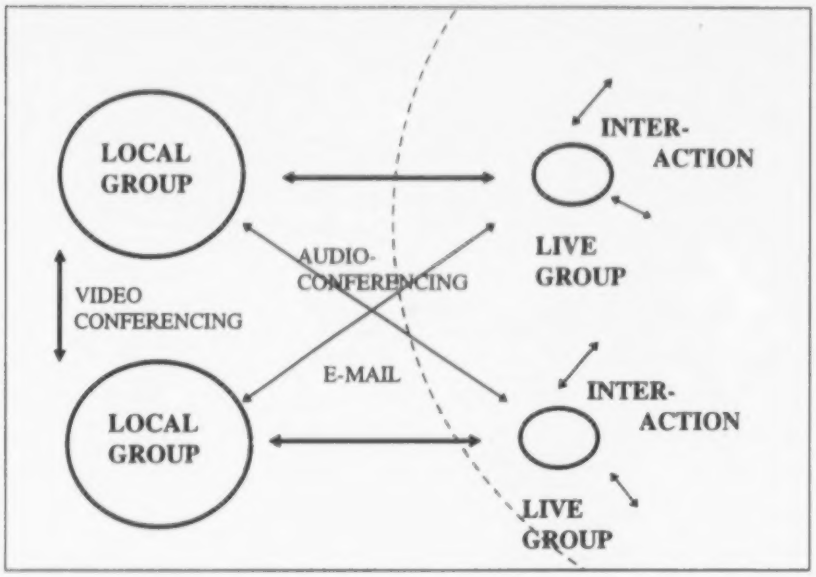

FIGURE 4. LIVE LEVEL II.

The role of the LIVE teams is to act as telematic expert teams in their own learner networks. The local teams communicate with each other via videoconferencing. The role of the local teams is to collect additional information about the topic from sources at school or from the Internet and ask the LIVE teams for reality-based corrections and explanations of the topic. The final product could be a joint report on the topic. Level II work may deal with e.g. regional geography, including comparisons of vegetation, topography, climate, or local cultures (see Figure 4).

The Third LIVE Level

At the third LIVE level, the nature of telecommunications focuses on the use of interactive multimedia. With integrated communications equipment, it is possible to transfer text, pictures, sound and full-motion video. With the LIVE model of work, this means getting real-world situations on

video and transmission directly to other learner teams. For their learning purposes, learners can combine audio or videoconferencing and audiovisual materials from the information network. A certain degree of media expertise is required for audiovisual media planning, e.g. camera angles and audio sequences, which is characteristic of the LIVE model of work at level III. Especially the possibility of visualisation is a major advantage of videoconferencing. It is also important in transmitting various forms of arts and crafts.

> "Compared with audiographics, videoconferencing gives both the teacher and the learner a better chance to follow events dealing with organising learning situations. However, with regard to the quality of teaching, the way the teacher and the learners construct knowledge in the learning situation is even more important" (Sariola 1996, 66–67, translated from the original Finnish text).

The third level in the LIVE model of work enables real-time comparisons between comprehensive network materials and real-life situations.

Learning and Teaching in the Virtual School Environment

In the LIVE project student teachers and teacher trainers work in co-operative projects with pupils as described above. As this happens, teacher education can provide a functioning virtual learning environment for all participants and especially for future teachers. It also provides a way to professional development of teacher trainers. To fulfil the criteria of an open learning environment (cf. Sariola in this publication), student teachers need to have opportunities to

make flexible didactic decisions about teaching methods and ways of using MICT. Those selections are meant to lead to meaningful pedagogical decisions which support open learning. In a telematic learning environment the teacher has to consider more carefully than before what kind of communication serves the teaching-learning process best both from the teacher's and the student´s or a student group´s standpoint (Tella 1995a, 31–32; Tella 1995b, 169). These considerations are basic to the common work with didactic networking models by teachers and students, which are here called LIVE models of work.

As the LIVE project is especially a development project of teacher education, it deals with the research and development of teachers' own work. Collaborating teams of teachers plan together topics and contents for learning activities and share their experiences of training and teaching situations. The experiences will be analysed and used for the next goals in the didactic development process.

Teaching and learning are regarded as interactive processes in the LIVE project, not to be separated from each other. Changes in the teacher's teaching affect the learner's chances to learn actively in a learning environment. The teacher provides the learner the framework and the opportunities for constructing his or her knowledge and skills. Learning in the virtual school environment enables the learner to work on many telematic levels. The rapid progress of MICT helps to make school change into a learning environment in which the interaction of teaching and learning is independent of time and space and in which the learners can create their own learning spaces. The changes in learning environments and telematic networking have a direct impact on the organisations of schools and universities. Students can study over physical borders in many kinds of learning centres or networks.

As the theoretical framework of the project is based on a student-centred concept of learning, the learning goals in the LIVE model of work are set to develop the learner's own level of knowledge and skills. The teacher's task is to give models how to set goals and evaluate them. The learner's task is to learn actively and responsibly in the direction of his or her own goals and those of the whole group. Because learning in the LIVE model of work is seen as a process, it needs to be evaluated during the whole process. Both the learner and the group evaluate themselves. Evaluation can be done as a portfolio assessment, which is based on the reflection of learning and on the analysis of the process within the group.

It is important in teacher education to create mobile, flexible learning situations in open learning environments. This gives students more chances to choose a school or a space where they can study with the help of MICT, e.g. for parts of their teacher training or their media education degrees. From the viewpoint of teacher education institutions, there will be more chances to provide interactive teacher training at both pre-service and in-service levels in a variety of places and for many groups of students. A functioning distance education network makes it possible to create a common virtual community of teacher education. As an example of virtual school, the LIVE model of work expands a local learning network to close interaction with the reality outside school. This can lead to a better awareness and understanding of the processes of life.

The Technical Infrastructure of the LIVE Project

Tomi Nummi

The purpose of this article is to introduce the technical infrastructure used in the LIVE Project. Three different technologies will be used, viz. videoconferencing, audiographics and mobile telecommunication, which will be described separately. Some other aspects on the development of communication technologies in the LIVE project and in general are also presented.

Key words: Mobile telecommunications; videoconferencing; audiographics; computer conferencing.

TECHNICAL ENVIRONMENT

The technical environment of the LIVE project is based on the simultaneous use of different telematic applications. In the distance learning network the partner schools are linked together with ISDN (integrated service digital network) lines, which enables the participants to communicate by videoconferencing and/or audiographics. When sending learning material or learning outcomes, the public switch telephone network is used for e-mail and telefax.

Since different kinds of mobile communication technologies play a central role in the technical implementation of the learning environments of the LIVE project, a public land mobile network (PLMN, in the Finnish context a GSM net-

work) is also being used. The learners leave the physical school building to gather and process information with the aid of modern information and communication technologies (MICT). They communicate in real time interaction with other learners by using cellular phones, laptop computers and integrated mobile communicators.

In the following various technical applications used in the project are shortly described. The focus is on the technical description of the media, as their pedagogical aspects are presented elsewhere in this publication (cf. Sariola in this publication).

VIDEOCONFERENCING

In the LIVE project an ISDN-based videoconferencing network is being used between the Media Education Centre and the partner schools. This network has been developed in co-operation with the manufacturing companies and adapted especially for educational purposes. In the LIVE project the different locations of the network are linked together with three ISDN lines, which provides the maximum data transfer rate of 384 Kbs. The lines are divided so that two lines (256 Kbs) are used primarily for videoconferencing and the third one is reserved for other data transmission purposes, e.g. audiographics audioconferencing, the Internet and telefax. This decision has been made because the tests showed that using the third ISDN line for videoconferencing as well does not significantly improve the quality of either the audio or the video signal.

At the moment two different H.320-compatible video codecs (video and audio signal coding-decoding unit) are being used. They are both controlled with the same Win-

dows 95-based XtoX software. In the older Philips Titan 2M system, which has already been used for four years, the codec is a separate piece of equipment, controlled by a PC. In autumn 1997 a new, desktop type XtoX Visual Meeting system was taken into use. In that system codec is integrated to a card inside the controlling PC. Since the videoconferencing equipment has lately developed towards smaller, more compact desktop systems, I will limit myself here to a description of the XtoX Visual Meeting and its features. For a more detailed description of the Titan equipment, see Salminen 1996, 35-36.

XtoX-Visual Meeting is a fully H.320 standard -compatible videoconferencing system which supports G.711, G.728, G.722 and MPEG-1 audio compression standards and T.120 data conferencing standards.[1]

XtoX also supports the TCP/IP protocol, which makes it possible to use the Internet for data transmission of videoconferencing. At the moment these connections through normal Internet lines are too slow for videoconferencing, but for example when having a video conference within the University of Helsinki the local ATM network is usually fast enough. The other problem with TCP/IP connections is that the data transfer rate can vary considerably during the session, while a fixed data transfer rate is obtained via ISDN lines.

XtoX Visual Meeting can be provided with up to three cameras. In the basic constellation one of the cameras called the

[1] T.120 is an International Telecommunications Union (ITU) standard for multipoint data conferencing and information sharing. It will enable meeting participants to share various types of information and data, such as graphics and text, among multiple sites using PCs, videoconferencing systems, multiunit conferencing servers and peripheral equipment. [http://129.11.147.8/imtc-mirror/t120.html 20. January 1998]

chairperson camera, is focused on the person using the controlling PC. The second camera, which is turnable, zoomable and auto focusing is used for showing a view from a certain sector of the classroom. The third camera works as a document camera to show paper-based material, pictures, images or other demonstration material. Either one of the first two cameras can be used as a document camera if a separate camera for that purpose is not available.

In the XtoX system all the controlling functions including the camera control can be handled through the same PC/Win95 -based interface. Outgoing or incoming video or the picture on the PC screen can be captured as a bmp-format still picture, edited and then returned in a new form to other videoconferencing sites. Bmp pictures from other applications can also be brought to XtoX.

FIGURE 1. XTOX VISUAL MEETING VIDEOCONFERENCING EQUIPMENT.

The equipment is also provided with a VGA-PAL converter, which makes it possible to convert the picture of the PC screen to an outgoing video picture. In that way, whatever software is installed in the PC (for example a Power Point slide show), it can be presented through videoconferencing. In some of our studios other external devices, such as a

scanner, printer or colour slide scanner, are also added to the system. A more precise description of the technical specifications of the XtoX Visual Meeting can be found on the manufacturer's web site.[2]

AUDIOGRAPHICS AND COMPUTER CONFERENCING

In some earlier open and distance learning projects carried out in the Department of Teacher Education (DTE), a special audiographics application has been used along with videoconferencing to transmit and simultaneously edit digitised material, pictures and text (cf. Salminen 1996, 36). In those cases either an LSD (low speed data) channel of ISDN lines or a separate, modem-based data transfer connection was used for audiographics connection. At present various audiographics applications are being developed for the Web. There are already several shareware applications, which have a shared whiteboard for real time text and graphics editing as well as features for computer-, audio- and even videoconferencing through the Internet.

In the LIVE project a product called Microsoft® NetMeeting™, which also supports the T.120 data conferencing standard is being used. In NetMeeting™ users can share applications and transfer files. A user can share a program running on one computer with other participants in the conference. Participants can review the same data or information and see the actions as the person sharing the application works on the program.

[2] [http://www.xenex.fi 20. January 1998]

NetMeeting™ also enables participants to use a whiteboard and a shared clipboard. The whiteboard program is a multi-page, multi-user drawing application that enables users to sketch diagrams, organisation charts, or display other graphic information for the benefit of people in a conference. The shared clipboard enables participants to exchange its contents with other participants in the conference. The program also makes it possible to use audio- and videoconferencing, but as it is used along with high quality ISDN-based videoconferencing, these features are not used in this project.[3]

MOBILE TELECOMMUNICATION

Rapid development in mobile telecommunications has made it not only possible but also interesting to explore the possibilities of these technologies in the field of education. A few years ago mobile telephone calls were the only service available, but today various data transfer applications are becoming more and more important. Also the saturation of cellular phones in Finland has reached the point where it has become an everyday tool like a VCR or a PC.

In the pilot phase and during the first year of the LIVE project a device called the Nokia 9000 Communicator has been used. It combines digital voice and data services and personal organiser functions into a single, small-sized device. In addition to voice calls, the Nokia 9000 Communicator enables users to send and receive faxes, e-mail and short messages as well as to access Internet services and corporate and public databases. It also provides users with or-

[3] [http://www.microsoft.com/netmeeting/ 20. January 1998]

ganisation functions such as an electronic calendar, an address book, a notepad and a calculator.

FIGURE 2. NOKIA 9000i COMMUNICATOR.

All the applications in the Nokia 9000 Communicator—phone, fax, address book, e-mail, the Internet—have the same integrated user interface. For example, to send a fax, the user just presses the fax application button, writes a note and selects a recipient from the address book. When the keyboard is closed, the communicator can be used as a GSM phone. When the device is opened for using the keyboard, the speakerphone is activated, allowing the user to view documents from the LCD screen while speaking.

For data transfer between the Nokia 9000 Communicator and a PC one can use either an infrared link or a special cable attached to the COM port of a PC. The operating system (GEOS™ 3.0 for embedded INTEL™ 386 processor) platform also provides an open development environment. Some special applications such as spreadsheet and bookkeeping software, as well as some Web-based services have already been tailored to be used by the Nokia 9000 Communicator.[4]

[4] [http://www.club.nokia.com/mobile_office/9000i/9000i.html 20. January 1998]

Costs

One of the main issues effecting the media selection process in every open and distance learning project is cost effectiveness. Choosing the best possible equipment is always a compromise between quality and price. Since line costs for all modes of telephony are relatively low in Finland, these technologies are also in the reach of educational organisations. For example, the ISDN line costs are the same as normal fixed telephone line costs for two telephone lines plus a fixed monthly fee of FIM 130[5]. If videoconferencing (with two ISDN lines) is used for one hour between sites in different telephone areas, the line cost will be around FIM 80. In the mobile network lines costs vary significantly between FIM 1.00 and FIM 1.75 depending on which service provider and type of service contract is used. One short message costs FIM 0.99.

The price of different pieces of equipment is another question with a lot of answers. The listed price for the Nokia 9000i Communicator is at the moment (January 1998) about FIM 4,000, but, for example, a year ago the price of an earlier version of the same device was double that price. For videoconferencing a wide variety of different applications are marketed. At the same time that the equipment is getting smaller and smaller, the price is coming down. At the moment the price for a desktop videoconferencing system with two cameras, an external TV screen and VGA-PAL converter is between 80,000 FIM to 100,000 FIM, depending on the quality of the cameras and external devices.

[5] On January 27, 1998, FIM 1 = USD 0.19.

FUTURE VISIONS

In the field of communication technologies two megatrends of 1990s have been mobile communication and the Internet. It is estimated that during the next five years another 250 million people will start using cellular phones. The figures are even more impressive when you look at the generational dimension. For example in Finland around 70% of 18–25-year-olds already have a mobile phone. The number of Internet connections is rising with similar speed.[6] When electronic shopping becomes more secure, and the Internet and television unite into one multimedia centre for the whole family that speed will accelerate (McClelland 1997, 298).

The second megatrend in communication technologies is predicted to be the combination of the Internet and mobile communication. The Internet will fit into your pocket. So far different mobile data transfer services have been "nice to have", but in some estimations, at the beginning of next century even half of all mobile communication will consist of data transferring. It will not be enough any more to make a voice call anywhere, anytime. You also need to be able to read and write e-mails, send and receive faxes, connect to your company´s intranet-based groupware application and even show live video from your present location (Hämäläinen 1996, 1-2; McClelland 1997, 300-301).

So far the biggest obstacle slowing down this development has been poor rate of data transferring. In the GSM network the data transfer rate is 9.6 Kbs, when the normal modem speed is 33.6 Kbs. With ISDN-lines, which are getting more

[6] [cf. http://www.mit.edu/people/mkgray/net/ or http://www.helsinki.fi/~tella/intaccipoints.html]

and more common even in domestic use, a transfer rate of 128 kbs/line can be achieved. Many solutions are being developed to speed up wireless data transferring. During the year 1998 a new wireless DCS 1800 (Digital Cellular System for 1800 MHz) network will be introduced for urban areas. With the DCS 1800 the data transfer rate will be doubled to 19.2 kbs. The leading network manufacturers have promised that with different wideband GSM data techniques and compression algorithms, the data transfer rate can be raised in the near future even up to 100 kbs. Then it will be possible to transfer live videoconferencing through wireless networks.

New, more efficient data processing services for mobile communicators are being developed along with network improvements. The basic idea in these services is to minimise the amount of data transferred through wireless networks by filtering the information essential to the users before sending it to them. An example of these services is "Smart Messaging", which enables users to access information from a specific web page on their cellular phone. The cellular phone sends a short message to a specified number and gets dated menus, for example Text TV news for the user to browse. Similar to browsing the Web, the user then picks a key word, which is sent as a short message to a server. The server searches and filters information from its databases and sends the acquired data back to user again using the short message service. This type of service is best suited to situations where the needed information is short, exact but at the same time constantly changing, like news headlines, weather forecasts, or not to mention betting odds.

THE TECHNICAL DEVELOPMENT OF THE LIVE PROJECT

During the next year the technical environment of the LIVE project will be further expanded. Special emphasis will be given to the further exploitation of various data transferring services in the mobile communication network. So far mobile communication equipment has been used for transferring text based data only, but soon it will be possible to attach a digital camera to the equipment via an infrared link. After that still pictures can also be transmitted between different groups of learners or to a Web-site in real time. In that way the idea of a digital and mobile portfolio as a real time tool for learning comes one step nearer to realisation.

Another area of development will be a closer linkage of the different technological applications used. At present videoconferencing and audiographics, as well as mobile communication and the Internet, can be partly used through the same interface, but the total integration of these environments is far away. It is realistic to assume that within a few years mobile communication equipment will be provided with more efficient Internet tools. That development would enable a smooth use of an integrated multimedia groupware solution.

The total integration of all these technologies perhaps goes beyond the time limits of the LIVE project, but if the mobile communication manufacturers are to be believed, by the year 2010 we will be referring to mobile communications tools as a technology with a fundamental and personal relationship with its users, akin to a wristwatch. The talk is of personal, pocketable communications of global mobile multimedia and of wireless communications that could be embedded anywhere." (McClelland 1997, 299)

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Tiivistelmät

Tella, Seppo. The Poor Relation of the Education System? Aspects of Open and Distance Learning and Distance Education

Tämän artikkelin tarkoituksena on kuvata ja analysoida pieniä eroja, joita aiemmin melko yksimielisesti kutsuttuun 'etäopetukseen' liittyvässä peruskäsitteistössä nyt havaitaan. Näitä uusia käsitteitä yhdistää mm. ymmärrys siitä, että yhä kasvava määrä ihmisen mielekkäinä pitämistä kokemuksista tulee institutionaalisen koulujärjestelmän ulkopuolelta. Etäopetuksessa ja siitä tai sen rinnalla kehittyneissä muunnoksissa on havaittavissa opiskelijan oman kontrollin jatkuvaa kasvua ja hänen lisääntyneitä mahdollisuuksiaan käyttää erilaisia resursseja, ajattelutaitojen samoin kuin oppimisstrategioihin liittyvien metakognitiivisten taitojen painottamista.

Yhä useammat opettajat ja opettajankouluttajat tiedostavat sen, että nämä etäopetuksen uudet muodot valtaavat koko ajan lisäalaa samalla kun ne ovat siirtymässä yhä keskeisempään asemaan valtavirtakoulutusjärjestelmissä.

Avainsanat: Etäopetus, etäopiskelu, avoin opiskelu, avoin ja etäopiskelu, joustava opiskelu, hajautettu opiskelu, monimuotoopiskelu.

Sariola, Janne. The Planning of an Open Learning Environment and Didactic Media Choice in Teacher Education

Artikkelissa tarkastellaan avoimen opiskeluympäristöön (an open learning environment) ja mediavalintaan vaikuttavia tekijöitä opettajan ja opettajankoulutuksen näkökulmasta. Suunnittelu ja mediavalinta nähdään osana suurempaa koulutuksen muutosta, johon sisältyvät oppimiskäsityksen muuttuminen kohti konstruktivismia, tieto- ja viestintätekniikan laajeneva pedagoginen soveltaminen sekä digitaalisen median muuttuminen osaksi jokapäiväistä inhimillistä toimintaa. Helsingin yliopiston Mediakasvatuskeskuksen tutkimus- ja kehittämistoiminnassa on pyritty löytämään sellaisia avoimeen opiskeluympäristöön soveltuvia suunnittelumalleja, joiden kautta opettaja ja opiskelija tulevat entistä tietoisemmiksi omista tavoistaan suunnitella opetusta, mutta samalla laajentaen

toimintaansa perinteisestä luokkahuonelähtöisestä suunnittelusta kohti opiskeluympäristölähtöistä suunnittelua. Oppilaan kannalta opiskeluympäristön suunnittelussa korostuvat tietoyhteiskunnassa tarvittavien taitojen tavoitteellinen kehittäminen ja omien opiskelu- ja oppimisstrategioiden arviointi.

Avainsanat: Avoin opiskeluympäristö; suunnittelu; liikkuvuus; digitaalinen portfolio; didaktinen mediavalinta, opettajankoulutus; mediakasvatus.

Vähäpassi, Anne. Variations of Co-Operative Learning: An Analysis of Four Different Approaches

Artikkelissa luodaan aluksi lyhyt katsaus yhteistoiminnallisen oppimisen alkuvaiheisiin Suomessa. Sen jälkeen kuvataan neljää erilaista yhteistoiminnallisen oppimisen suuntausta, niiden pääpiirteitä ja eroja: David ja Roger Johnsonin kehittämää yhdessä oppimisen (Learning Together) mallia, Spencer Kaganin luomaa rakenteellista lähestymistapaa yhteistoiminnalliseen oppimiseen (Structural Approach to Co-Operative Learning), Elizabeth Cohenin kehittämää monitahoisen/kompleksisen opetuksen (Complex Instruction) strategiaa ja Yael ja Shlomo Sharanin ryhmätutkimuksen mallia (Group Investigation). Mallit on valittu tarkastelun kohteiksi siksi, että Kaganin mallia lukuun ottamatta ne ovat tähän saakka tunnetuimpia Suomessa. Kaganin malli esitellään sen yleistettävyyden ja käytännönläheisyyden vuoksi.

Avainsanat: Yhteistoiminnallinen oppiminen; monitahoinen/ kompleksinen opetus; ryhmätutkimus.

Kynäslahti, Heikki. What the LIVE Project Tells us About the Nature of the School

Tässä artikkelissa tarkastellaan koulua sekä paikkaan liittyvänä että ajallisena isolaationa. Ympäröivää todellisuutta käsitellään koulussa eräänlaisen simulaation kautta, jolle on ominaista ajallinen viive. LIVE-projekti muuttaa tätä koulun luonnetta muokaten koulua välittömämmin ympäristöönsä liittyväksi.

Edelleen pohditaanmyös sähköisen tilan, ruumiin ja esineen suhdetta. Tässä tuodaan kyborgin idea spekuloitavaksi koulun suhteen. Virtuaalikoulun määritelmiä voidaan kehittää yhä enemmän tavan-

omaisen koulun ja virtuaalikoulun muodostaman symbioosin suuntaan, jolloin koulun voidaan katsoa luonteeltaan muistuttavan kyborgeiksi kutsuttuja ilmiöitä.

Avainsanat: Koulu; virtuaalikoulu; kyborg; tietoyhteiskunta.

Rönkä, Aarno. An Overview of Modern Information and Communication Technologies (MICT) in Teacher Education at the Helsinki University Department of Teacher Education

Artikkelin tarkoituksena on kuvata moderniin tieto- ja viestintätekniikkaan kohdistuvan kasvatustieteellisen tutkimuksen kehitystä Helsingin yliopiston opettajankoulutuslaitoksessa. Näkökulmana ovat ne kehityslinjat, jotka ovat johtaneet nykyiseen avoimen oppimisympäristön ja etäopetuksen sekä virtuaalipedagogiikan tutkimukseen erityisesti Mediakasvatuskeskuksessa. Toteutuneen tutkimuksen yhteydet opettajankoulutuksen ja koulujen opetuksen kehittämiseen pyritään tuomaan esille.

Avainsanat: Moderni tieto- ja viestintätekniikka, avoin ja etäopiskelu; virtuaalipedagogiikka.

Ristola, Riikka & Rönkä, Aarno. Findings from the Pilot Stage of the LIVE Project

Artikkelin tarkoituksena on kuvata kuinka LIVE-projektin pilottivaihe toteutettiin keväällä 1997. Kevään aikana testattiin LIVE – projektin työskentelymalleja eri tasoilla. Alustavat havainnot osoittivat, kuinka tärkeä rooli didaktisella mediasuunnittelulla on LIVE työskentelyn onnistumisessa. Pilottivaiheessa korostuivat myös oppilaiden metakognitiiviset taidot, kommunikaatio-, sosiaaliset-, yhteistoiminta- ja tieto- ja viestintätekniikan hallintataidot.

Avainsanat: LIVE; opiskeluympäristö; didaktinen mediasuunnittelu; metakognitiiviset taidot; opettajan rooli.

Nummi, Tomi, Sariola, Janne & Rönkä, Aarno. The LIVE Project: Learning in a Virtual School Environment

Artikkelissa kuvaillaan Helsingin yliopiston opettajankoulutuslaitoksen Mediakasvatuskeskuksessa toteutettavaa kolmivuotista (1997–2000) LIVE (Learning in a Virtual School Environment) -tutkimus- ja kehittämisprojektia. Opettajankoulutukseen suunnatun projektin yleistavoitteena on kehittää uusia didaktisia malleja virtuaalikoulunomaiseen ympäristöön liikkuvan viestinnän näkökulmasta. Erityistavoitteena on tutkia, miten opiskelutilanteissa voidaan lisätä avoimen ja joustavan opiskelun piirteitä ja samalla hyödyntää tehokkaasti uutta tieto- ja viestintätekniikkaa. Teoreettinen viitekehys rakentuu viiden käsitteen (konstruktivistinen oppimiskäsitys, yhteistoiminnallinen oppimisen, kokemuksellinen oppiminen, avoin ja joustava opiskeluympäristö ja virtuaalikoulu) luomalle perustalle. .

Projektissa käytettävät matkaviestimet tarjoavat uusia mahdollisuuksia koulun ja sitä ympäröivän todellisuuden reaaliaikaiselle vuorovaikutukselle oppimistilanteissa. Tutkimuksessa hyödynnetään opettajankoulutuslaitoksen ISDN- ja GSM-pohjaista kouluverkkoa, joka koostuu Mediakasvatuskeskuksesta, harjoittelukouluista ja pienistä maalaiskouluista. Koulut ovat yhteydessä toisiinsa kolmen ISDN-linjan välityksellä, mikä mahdollistaa videoneuvottelun ja audiografiikan avulla tapahtuvan kommunikaation oppilasryhmien välillä. LIVE–projekti on osa opettajankoulutuksen mediakasvatuksen opintoja. Projektilla on liittymäkohtia Mediakasvatuskeskuksen koordinoimaan perus- ja täydennyskoulutukseen ja sitä toteutetaan erityisesti osana etäopetusharjoittelua. Opiskelijat tutustuvat harjoittelun aikana virtuaalikoulun opetusmenetelmiin ja toimintamalleihin.

Avainsanat: Konstruktivistinen oppimiskäsitys; yhteistoiminnallinen oppiminen; kokemuksellinen oppiminen; uusi tieto- ja viestintätekniikka; avoin ja joustava opiskeluympäristö; opettajankoulutus; virtuaalikoulu.

Nummi, Tomi. Technical Infrastructure of the LIVE Project

Tämän artikkelin tarkoituksena on esitellä LIVE–projektin teknistä laiteympäristöä. Projektissa käytettävät teknologiat on jaettu kolmeen osa-alueeseen, videoneuvotteluun, audiografiikkaan ja kannettaviin matkaviestimiin, joita kutakin tarkastellaan erikseen. Lisäksi artikkelissa pohditaan viestintätekniikan yleisiä kehitysnäkymiä ja niiden vaikutuksia LIVE–projektin teknologiselle kehitykselle.

Avainsanat: Telekommunikaatio; videoneuvottelu; audiografiikka; tietokonekonferenssi.

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